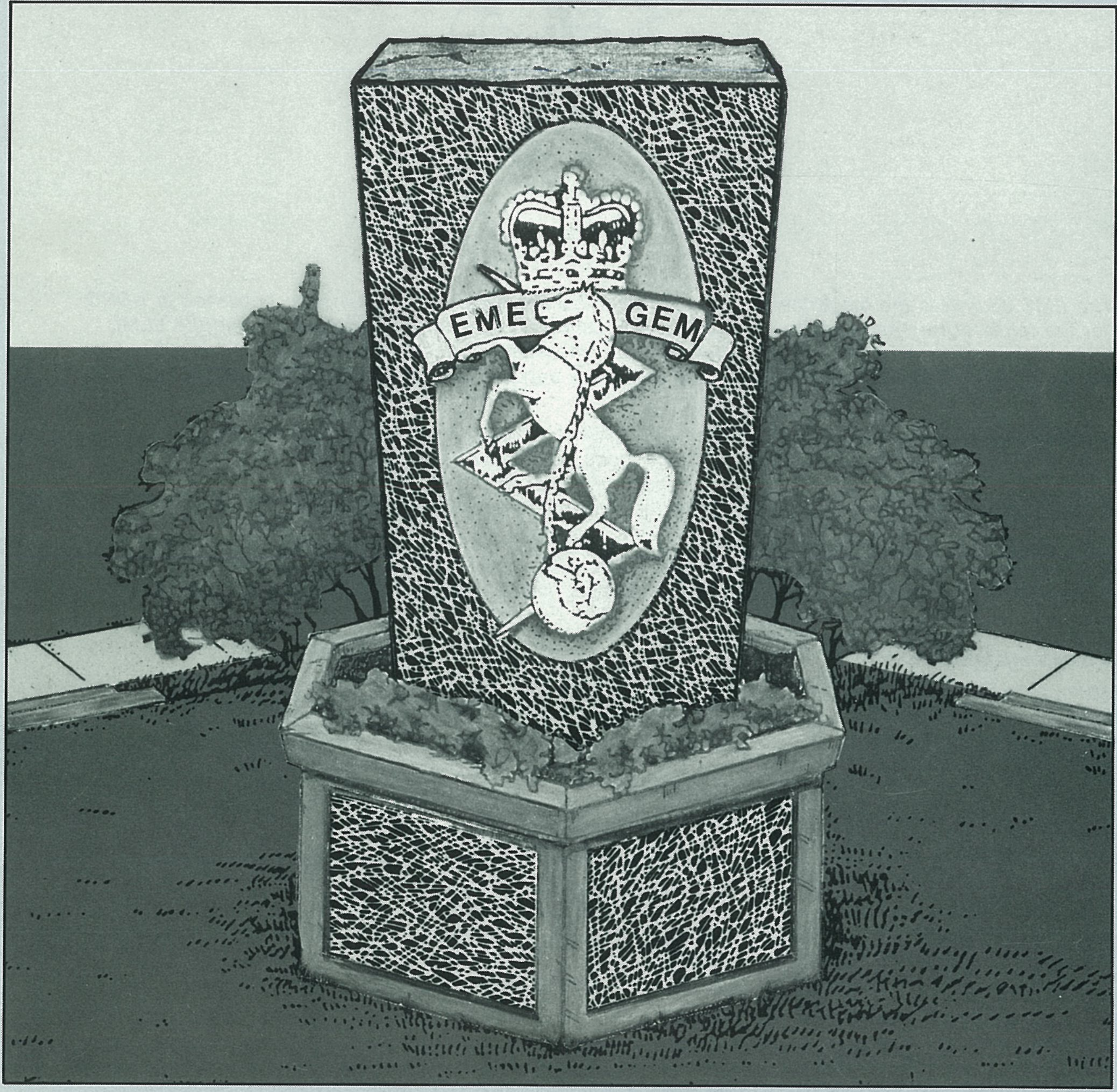
National Defence Défense nationale

EME JOURNAL

01/91



Canada

The EME Journal is the magazine of the Land Electrical and Mechanical Engineers, published at NDHQ under the terms of reference of the Director General Land Engineering and Maintenance and the LEME Branch Adviser. The purpose of the publication is to disseminate professional information among members and exchange opinions, ideas, experience and personnel news, and promote the identity of the LEME Branch.

The EME Journal depends upon its readers for content. Articles on all aspects of the Electrical and Mechanical Engineering System, photographs, cartoons, people news and comments are solicited. Readers are reminded that the Journal is an unclassified and unofficial source of information. The contents do not necessarily represent official DND policy and are not to be quoted as authority for action.

Contributors are asked to submit the original text typewritten, double spaced, paper size as herein. Photos should be sharp, glossy, black and white prints with captions typed separately. Personnel should be identified in all cases, both text and captions, by rank, initials, surname, trade and unit.

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DPGS 7-2

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From the Director General Land Engineering and Maintenance and LEME Branch Adviser

Since the last edition of the EME Journal all members of the LEME Branch have been officially rebadged. This historical milestone will be the focus of our Fall '91 issue. Your Editor will be most appreciative if you send him photographs, base newspaper clippings and any anecdotal material to help us put together an issue which is certain to become a collector's item.

The summer season always brings with it changes in key appointments. During the CFSEME change of command parade held on 18 Jun 91 between BGen Pergat and Col Brewer, I took the opportunity to acknowledge the important contribution made by Col Svab during the past four years as our Colonel Commandant. He has given much of his time and energy to fostering goodwill and esprit-de-corps throughout the Branch. His predominant concern was always looking after the welfare of the individual Craftsman; his legacy can best be summed up by these few words: "Remember the Craftsman". We wish him health and a long and happy retirement.

I also presented Col Murray Johnston with the Governor General's scroll appointing him as our new Colonel Commandant. Col Johnston brings a wealth of experience and unbridled enthusiasm to his new appointment. As the author of "Canada's Craftsman", he is eminently well suited for his new role as we draw closer to 1994 and the celebration of the 50th Anniversary of RCEME.

The past few months have also seen a change in our Branch Chief. We welcome CWO Art Rest to his new appointment and bid farewell to CWO Ron Roy who has taken up the position of ETSM of Maintenance Company, 2 Service Battalion. CWO Roy will best be remembered by the inscription on this year's DGLEM Award which reads: "Presented to CWO R.E. Roy for bringing back the Horse to the LEME Branch". He has secured his place in our Branch history and deservedly so. CWO Rest brings tremendous knowledge and experience to this job; he is a respected and well known member of the Branch and I intend to exploit his talents to the fullest.

Now that we have once again donned the insignia of our historical past, it is time to concentrate on equally important and pressing issues. The senior members of the Branch represented by the LEME Senate have begun to develop a long term plan to address these issues. You can help the Senate in its deliberations by expressing your views through the EME Journal.

Arte et Marte

DGLEM Award – 1990

The DGLEM Award is presented annually by the Director General Land Engineering and Maintenance (DGLEM) for outstanding service to the Land Maintenance System or to LEME Branch. The 1990 DGLEM Award was presented to Maj D.B. Parker, currently serving in the Canadian Contingent Multi-National Forces and Observers (CCMFO), by the former Minister of National Defence the Honourable William McKnight.

Major Parker was presented this award in recognition of his outstanding support to the Land Maintenance System during his tour as SO Maint at CFTS HQ. He spent over two years researching and studying the many faceted aspects of maintenance management including the identification of 23 critical factors impacting upon a maintenance commander's ability to perform the functions associated with running a Land Maintenance Workshop within the Canadian Forces.

The result of these efforts was the production of a comprehensive document entitled "Guide to Maintenance Management in the Land Maintenance System" which is now in use by the CFTS for all Command inspections and is also being used as a reference document for training and in the development of the Workshop Management System for the Canadian Forces.

Meritorious Service Medal (US) to Maj R. Stewart

On 15 January 1991, Major Ross Stewart, SO Maint CFTS HQ, was presented the Meritorious Service Medal (US) by Commodore J.E.D. Bell, Commander CFTS. This award was initiated by Major General Akin, the Commanding General of TECOM, while Major Stewart was employed as Canadian Forces Liaison Officer at Aberdeen Proving Grounds.

The citation on the accompanying certificate read:

"This is to certify that the President of the United States of America authorized by Executive Order, 16 January 1969, has awarded the Meritorious Service Medal to Maj Ross H. Stewart for outstanding meritorious service from 22 June 1987 to 15 July 1990 as the Canadian Forces Liaison Officer to the United States Army Test and Evaluation Command. His professionalism, experience, and technical expertise contributed significantly to the research, development, test and evaluation efforts of both the United States and Canada. He was an especially effective conduit for the exchange of technical information and reports concerning such areas as test methodology, instrumentation and systems evaluation. Major Stewart's experience, technical expertise and commitment to excellence ensured an extremely productive international collaborative effort and reflect great credit on him and on the Canadian Armed Forces."

The RCEME 50TH Anniversary Memorial Monument

As you all know, we are celebrating the 50th anniversary of the Royal Canadian Electrical and Mechanical Engineering Corps on 15 May 1994. For this occasion it was decided that the highlight of the celebrations would be the unveiling of a memorial monument.

The preparation and planification for these celebrations started in 1987 with the assignment of responsibilities to different LEME organizations across the country. All the work and decisions made since that time were eventually collated and integrated into a document known as the "National Management Plan for the 50th Anniversary of RCEME Celebrations". This is now the guiding document for all the activities related to the 50th anniversary celebrations.

One responsibility that was assigned to the Canadian Forces School of Electrical and Mechanical Engineering was to raise the funds required and procure a memorial monument. The fund raising objective was set at $260,000.

This initiative was started in 1989 and is well on its way. At the time this article is being written, we are within $1,000 of where we should now be. However, much remains to be done since we have only raised 30% of the funds required so far.

While the fund raising is progressing, we are now working on part two of our mandate, the selection and procurement of a memorial monument.

Six months ago, different artists across Canada were approached and requested to submit proposals for our 50th anniversary memorial monument. They were requested to meet certain criteria in their proposals.

The monument had to be constructed of lasting material (we wanted something that could last about 100 years without major deterioration), it had to be artistically pleasing, be militarily accurate, blend with the surrounding of the proposed site and be readily identifiable with RCEME. In addition, we wanted something that would not exceed $200,000 to procure and that would require a very low annual recurring maintenance.

On the closing date for the submissions, 01 March 1991, we had a total of six proposals from three different companies. As most of you would probably have guessed, most of the proposals were centred around the RCEME hat badge. This is not surprising given the difficulty of coming up with a monument that had to be representative of our past and of the different trades in our Branch presently.

The proposals were evaluated by the members of the senate and representatives from both the LEMEA and the RCEMEA on the 8th March 1991. The evaluation was done in a rather formal way with each proposal being evaluated against 17 different factors. Thefactors had a range from zero to ten and were assigned different weights. The most important factors were five times as important as the least important ones. For example, durability of the material was fives time more important than the artist's reputation.

To the surprise of most people on the evaluation committee, the winning proposal was ahead of the competition by a long shot. Out of a maximum possible score of 590 points, the winning proposal scored 504 points with 380 points for the runner-up. The best proposal was so clearly ahead of the competition that the winner was announced immediately and CFSEME was requested to start contract negotiations as soon as possible.

What you see on the cover of the EME Journal is the proposed 50th anniversary memorial monument. This proposal was submitted by Sanderson Monument Co Ltd, from Orillia, Ontario, and it is the creation of Mr Sean Shields, the Art and Design Manager of Sanderson Monument.

The monument will be made completely of granite in three colour ranges, black, red and grey. The new EME hat badge will be etched into the central piece of black granite. The oval surrounding the hat badge will be recessed with the deepest area being immediately around the badge, to a depth of approximately six inches, and gradually levelling out to the same level as the polished surface of granite. The details of the hat badge will be hand diamond etched.

Each of the previous hat badges will be carved at the ends of the two walls surrounding the central feature. At the back of the large centre piece, we will place the history of the RCEME Corps. To give you a feel for the size of this monument, the central feature, ie the large black block of granite will measure nine feet tall by five feet wide by one and a half foot thick. It will weigh over 17000 lbs.

The names of all the donors who will have contributed more than fifty dollars by end of 1995 will either be carved or engraved on the monument. I cannot tell you what is going to be the size of the letters as yet but I can tell you that the larger your contribution, the larger the letters in your name and more prominent the location. Think about it; for about one dollar a month from today to end of 1995, you could have your name on this monument forever. If you think this is not for you but for all these rich guys like the Majors and Colonels, I would like to inform you that we have a MCpl who has pledged $5,000 for the 50th Anniversary and many Privates will have their name on the monument.

The Sanderson proposal was meeting all the requirements as requested in the request for proposal. In addition, it was also seen as extremely functional. Being located directly in front of the CFSEME Hq, at CFB Borden, it will be an ideal place to take pictures on special occasions like promotions, medal and certificate presentations, etc.

Two factors considered during the evaluation were the financial reputation of the company and their past achievements. The Sanderson proposal received very high scores in both these areas.

This company is the largest monument maker in Ontario and one of the ten largest in North America. It has many retail offices across Canada and has been in business for more than one hundred years, since 1872 to be exact. The company was founded by a young stonemason from Scotland, RJ Sanderson. He had originally come to Canada to work on St James Cathedral in Toronto. A side trip to see where the limestone he was using came from, took him to Longford Mills, near Orillia, Ontario, where he later on set up shop.

Sanderson Monument has been a family business during all these years. The firm is now headed by the great-great grand son, Don Sanderson and presently employs over 45 people.

This company is not new to the large monument business. Recently they were involved in three major projects, the monument to commemorate the papal visit in Midland, the Terry Fox monument in Thunder Bay and the Firefighters monument at their training college in Gravenhurst.

We expect to have a contract signed with Sanderson Monument by end of May 1991. Although the contract negotiations are not over yet, I can safely tell you that this monument will cost in the neighbourhood of $200,000. It would be nice to have all the money in the bank before we sign the contract, but we cannot wait that long if we want our monument for the 15 May 1994. We will have to continue with the fund raising activities while the monument is being constructed. I am sure that the Branch can count on your generous contributions and it is with confidence that we will sign this contract knowing that the money will be there to pay for it.

JPJD Forget
Major
Assistant Treasurer 50th Anniversary

Land Electrical and Mechanical Engineering Association Report

HONOURS

The Association recognizes that some of its members have given especially long, dedicated and/or outstanding service to the Branch and/or the Association. There are several ways in which this is recognized including, appointment as an Honourary Life Member, appointment as an Honourary member of the Executive and special recognition at the Association's Annual Dinner.

Several members have been appointed Honourary Life Members including:
MGen (Retd) E.B. Creber OMM CD,
Capt (Retd) W.L. Sheldon,
Maj (Retd) A.S. Olver and
Maj (Retd) D.C. Ferguson.

Appointments as Honourary members of the Executive have included:
LCol LeS. Brodie CM ED,
Col (Retd) A.L. MacLean CD and
BGen (Retd) B. Mendelsohn CD.

Those who have been specially honoured at an Association Annual Dinner include:
LCol (Retd) K. Bradford OBE ED and
Col (Retd) K.D. Sheldrick ED.

Here is a brief rundown on their appointments.

As the Association original Secretary-Treasurer, Colonel Brodie served in that position for 30 years. He was appointed Honourary Secretary Treasurer Emeritus in 1975 in recognition of his long and dedicated service in that position.

A former DGLEM and Associate ADM Mat, General Creber was appointed an Honourary Life Member in 1982. This was in recognition for his constant support to the Association over many years particularly during his term as DGLEM 1974-1979.

In 1985 Col MacLean and General Mendelsohn were appointed for three year terms as Honourary Vice Presidents in recognition of their long service to the Branch as Regular Force Officers and as members of the Association. Both were reappointed in 1988 and are currently serving in that capacity. During the time of integration Colonel MacLean served as Commandant of the RCEME School and as such was the Head of the Corps of RCEME. An active member of the Association he was Vice President when he was appointed Colonel Commandant serving in that capacity 1975-1979. General Mendelsohn as DGOS 1968-1972 also served as the Head of the Corps of RCEME. He later served as Colonel Commandant 1979-1983.

At a special testimonial ceremony during the Association's Annual Dinner in 1987 Colonels Sheldrick and Bradford were each specially honoured for 60 years dedicated service to the Branch and the Association. As a special surprise for them their sons were in attendance for the dinner to help mark the occasion. Colonel Sheldrick joined the COTC in 1928. Later he served in the Militia before and after World War Two and Active Force during the war. A Past President of the Association, he was the driving force in having the Association focus on national issues particularly those dealing with Defence Industry Preparedness.

Colonel Bradford had also joined the COTC in 1928. He joined the 2 Army Field Workshop (RCOC(E)), one of the original units of what today would be called a Militia Maintenance Company. The unit went overseas in 1939. As the CREME HQ 1 Cdn Div he participated in the Pachino landings in July 1943. As such he was the first to command maintenance troops in action. In the spring of 1944 as the AQMG (WP) 1 Canadian Army he was responsible for the program for waterproofing the equipment used by the Canadian Divisions on the D-Day Landings. He is also a Past President of the Association and a Charter member and continues to be an active member of the Toronto Chapter.

Captain Sheldon was a charter member of the Association and a Veteran of World Wars One and Two. An active member of the Toronto Chapter he had rendered faithful and dedicated service to the Association since its inception. He was made an Honourary Life Member in 1987 just before he died.

As a result of the Capt Sheldon's appointment and death shortly after, the Association has instituted an informal policy of singling out members who by popular consensus deserve recognition and giving them that recognition while they are able to enjoy it.

Major Olver is a Charter member of the Association and has been a dedicated and active member of the Toronto Chapter for 45 years. In recognition of this service he was appointed an Honourary Life Member in 1989.

In 1990 Major Ferguson was appointed an Honourary Life Member also in recognition of 45 years service to the Association. As a charter member he has served twice as President. In 1969 as part of the Militia reduction the RCEME Militia were to be disbanded. However, the Association led by Major Ferguson were able to intervene on short notice with sufficient arguments and support that the RCEME Militia remained in the ORBAT of the Reserves.

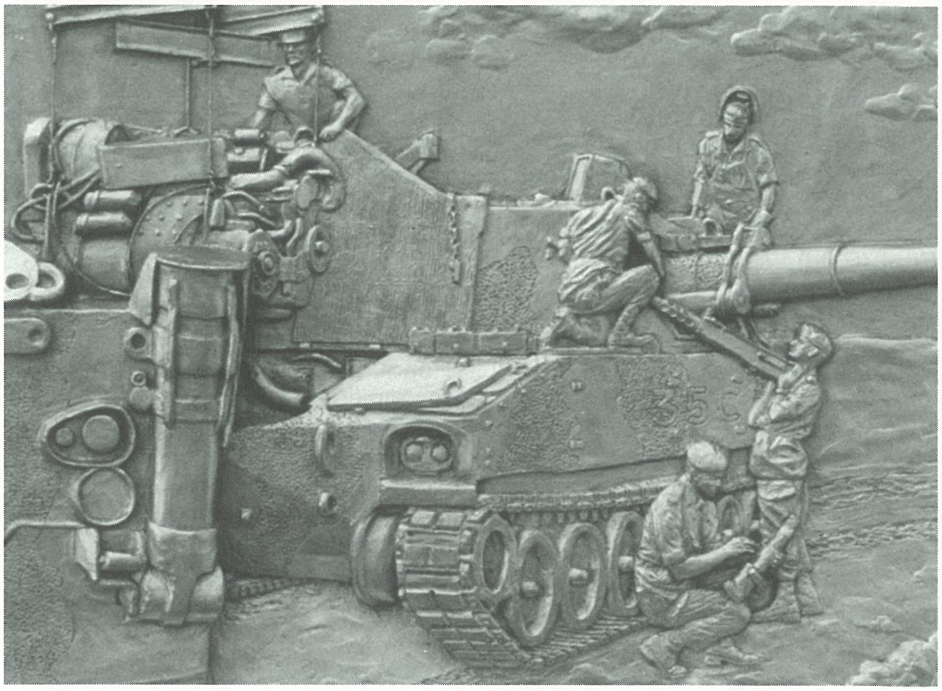
SENIOR SERVING LEME MILITIA OFFICER

This honour falls to LCol A.R. McLaughlin CD. Colonel McLaughlin joined the COTC in 1958 and has served continuously in the reserves since then. While pursuing postgraduate studies in the UK from 1963 to 65 he served in the Territorial Army's REME Workshop attached to 324 Heavy Air Defence Regiment. On his return to Canada he joined 20 Tech Sqn RCEME as a Lieutenant later commanding it. He was the CO of 33 (Halifax) Service Battalion 1985-89. He is currently the CI Advanced Training Wing at Headquarters Atlantic Militia Area and is also the 1st Vice President of the LEME Association.

New Craftsman Statuette

After the great success of the first statuette, the Vehicle Technician (only 8 left), it was logical to follow up the series with the next trade, the Weapon Technician. No artist's impression of what this statuette will resemble is available yet. Actually, we welcome suggestions. Based on the price of the first statuette, and taking into consideration inflation and the increase in the cost of material, the next is expected to cost around $600.

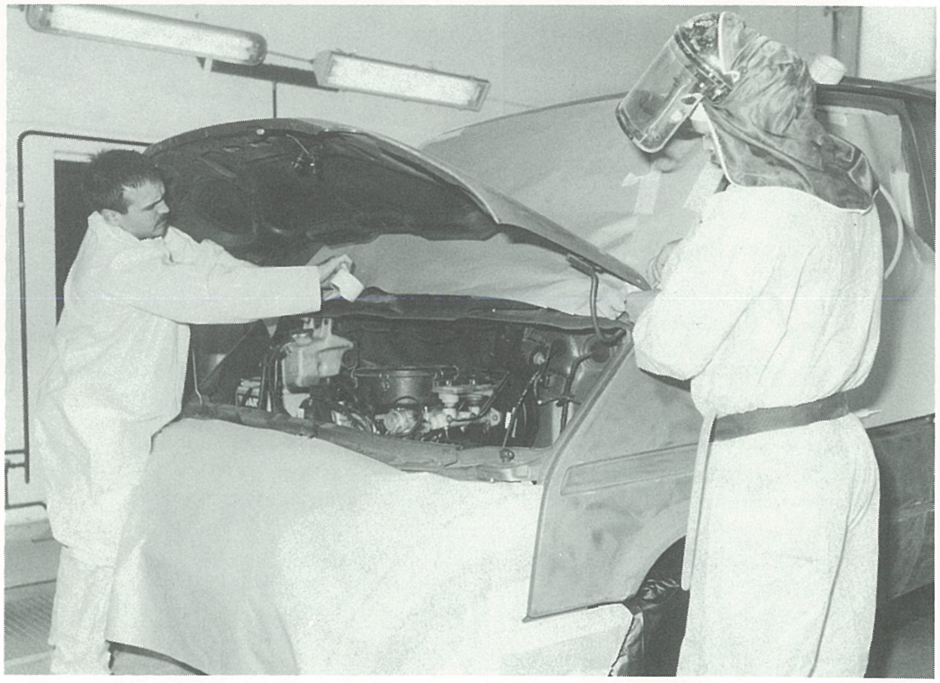
For those who like the concept of the statuette, but do not want to spend this amount of money, another kind of statuette is available for $250. This one represents all four trades which presently form the LEME Branch. The four groups of technicians are pictured working on a M109.



From Canadian Forces Europe

EME Support to OP Scimitar

by Lt S.J. Flight, B Maint (L) CFB Lahr



Cfn Seguin (left) Mat tech 441, and Mr. Lepage, body shop tech, mask and prepare a carryall for painting.

Every military operation overseas, be it direct involvement in a conflict or in support of a united effort, brings our primary role as EME soldiers into sharp focus. Operation Scimitar was no exception. As CFB Lahr was designated the mounting base for movement to the Persian Gulf, Base Maintenance (Land) found itself working long and busy hours to ensure that the deployment ran as smoothly as possible.

Operation Scimitar officially began 14 September 1990 with a declaration from the Prime Minister and it was soon determined that equipment would need to be marshalled from CFB Lahr, 1 Canadian Division Forward Units, CFB Baden and even from Canada. As this materiel arrived Base Maintenance (Land) personnel found themselves responsible for inspecting and repairing a large quantity of technical equipment, prior to movement to the Gulf. Faced with this overwhelming task, Base Maintenance (Land) members rolled up their sleeves and jumped in with both feet. Keeping in mind the requirement to provide daily support to normal base operations, each platoon found itself working long overtime hours to get the kit out the door and onto the aircraft.

Ancillary Platoon provided 1200 hours of direct labour and 500 hours of overtime in a period of less than four weeks. During this time, a variety of different tasks were completed, including the modification of close to 3000 C7 magazines, repair of generators, refrigerator units and the preparation of the nightmarish MLBU's! The body and paint shop sanded and painted 80 vehicles in desert camouflage to blend in with the camels and sand in the Gulf. In addition the weapons shop manufactured a number of propane stoves to cook fresh rations for the troopies at Canada Dry II.

Vehicle Platoon also pulled its weight to get things rolling for the deployment phase. Approximately 1100 direct labour hours and 700 hours of overtime were devoted to Operation Scimitar in less than four weeks. Vehicle Platoon conducted the final inspection and preparation of close to 100 vehicles and trailers. Vehicles were initially prepared by the holding units and then funnelled through CFB Lahr's Departure Assistance Group (DAG). The DAG was manned, operated and controlled by Base Maintenance Vehicle Technicians, who ensured quality control was high and the equipment was fit to fly. In addition, 24 hour MRT and refueller repair crews were formed to support the Air Head and ensured the movement of equipment and supplies was conducted smoothly and efficiently. All this activity was in addition to normal Base Maintenance operational requirements, making for a very busy month.

The result of Base Maintenance's heavy workload was a heavy flow of 1020s and MAC codes. As such, Base Maintenance Headquarters played a vital role by coordinating the workflow and processing the paperwork. Procurement of parts on the German economy and through the CFSS, is often difficult at the best of times, yet the Control Office came through with flying colours. Hard work on the part of the Orderly Room and the Control Office was vital to the completion of the mission, especially the coordination of the fast running repair scaling requirements and the preparation of personnel to be deployed. However, no operation runs exactly as planned. Confusion tended to run rampant at times,

The DAG team, MCpl Jones, (left) Cpl Daigneault (top) 411 and Cpl Pilotte 411, inspect FEL from CFB Baden.

especially when faced with vehicles that didn't fit on the aircraft, aircraft shelters that collapsed after construction, (White Elephants!!) and the Artic tent requirement as detailed by Command for Gulf operations?! A little communication and a sense of humour can go a long way in such situations, resulting in a quick resolution of these "minor problems".

It is interesting to realize exactly how much planning and organization is required to mount an operation the magnitude of Operation Scimitar. Operational requirements, such as desert camouflage and preparation of people and items, including NBCW training and equipment, makes all military personnel realize that they are members of a team. Also keep in mind that our presence in the Gulf demands continual support from CFE units. And it is at times like these that our EME craftsmen rise to the challenge and realize the true importance of their vital profession.

Arte and Marte.

Maintaining Modern Electronics

By Capt J.Y. Carrier, 4 AD Regt

In 1989, the Canadian Forces purchased and introduced a state-of-the-art air defence weapon system made by Oerlikon. It is a very sophisticated piece of kit containing microchips, intricate circuitry and computers with delicate software. Between the present maintenance system and the new technology, a giant gap exists.

Progress in Technology

Man's dream to reach the moon and fly amongst the stars introduced a new technology to the industrial world called integrated circuitry. It created computers, lasers, videos, and new scientific concepts, in short a modern way of living. When integrated circuits are placed on a plastic card and linked by intricate mazes that define paths of information, the assemblage is called a circuit card. Today, circuit cards are used everywhere; in industries, at home, work or play, in cars, computers, stereos, etc. Their use has no limit. In the Canadian Forces this technology is seen in the fire control system of the Leopard main battle tank, the MILIPAC (Military Portable Artillery Computer), and various communications equipment just to name a few.

In the eighties, the silicon industry took the world one step further by reducing circuit cards and integrated circuits to penny-size microchips. Microchips made computers portable, telephones wireless, watches into TVs, and vinyl recordings to CDs. When microchips are assembled together in a box and fulfill a particular function, they are called a module. For the Army and more specifically the air defence world, this evolution made its first appearance in 1989, with the introduction of the Oerlikon Air Defence System. How have these new technologies affected the maintenance system?

For our electronics technicians, trying to keep up with the development in the electronics world is a job in itself. It means spending half of their career on various courses because the Canadian Forces still maintains equipment dating from the fifties, while it is purchasing state-of-the-art systems. As the world progresses and maintenance becomes more specialized, the Canadian Forces continue to require that technicians be able to repair the old and the new. How long can we demand these standards from our personnel?

Maintaining new Technologies

Integrated circuits and circuit cards made few changes to level one maintenance; repairs simply involve replacement of faulty cards. The time-consuming process is the diagnosis. Both lines of maintenance use more sophisticated test equipment, require specialized tools and a dust-free, ion-free and temperature-controlled environment. If first line cannot quickly isolate the fault, then the broken piece of equipment is given to second line for in-depth investigation and possible repair of the card itself.

Modern pieces of equipment which contain modules, computers, and integrated self-testing programs, such as the Oerlikon weapon system, make maintenance even simplier. First line technicians read a code displayed on the central computer's screen, locate the faulty module, and replace it. Such a system simplifies diagnosis and repair so that the equipment can be fixed in situ by first line with minimal delay to operations. Repair of the faulty module requires sensitive test equipment, microscopes and very specialized tooling. The working environment also requires stringent standards with respect to magnetic fields, ions, dust, and temperature. Such an environment is extremely expensive to create in a static workshop and is highly unlikely on the battlefield.

Maintaining modern weapon systems can be easy, inexpensive, and limited. It can also be sophisticated, costly, and in depth. The Canadian Forces is presently at this decisive stage concerning the Oerlikon weapon system.

The Choices

To maintain a modern weapon system, the simpliest choice is to keep large quantities of replaceable items in stock and hope that your estimated attrition rate was accurate enough to keep your system operational in both war or peace. This then means that first line replaces the faulty items and second line becomes a post office to the manufacturer, the repair facility for replaceable items, modules. This solution is the cheapest, but also poses problems. Is the supplier financially stable enough to stay in business in peacetime and will he be able to provide replaceable items in war? Consequently, the Army becomes very dependent on the manufacturer, and his sub-contractors, who monopolizes the third level of maintenance.

The expensive choice is to build a proper repair facility to deal with this modern technology. The advantages of this solution are gained in the acquisition of the maintenance expertise and self-sufficiency in peacetime or war. These benefits are often overlooked because of the high cost involved. If the Canadian Forces was to acquire this expertise where would the facilities be located? At second line, where enemy artillery fire could blow away millions of dollars of material and unique test equipment with just a few rounds? Not a good option. Locating it at third line is more logical as it is further away from any serious enemy threat. This would again create a post office at second line as in the first choice.

The Future

Military equipment manufacturers are making more use of microchips and modules in their design because of reliability, maintainability, and low cost of production. It is evident that this is the technology of the future and will appear more frequently as the Canadian Forces continues its equipment modernization plan. Now that we have a state-of-the-art weapon system and are in progress of purchasing others, shouldn't we acquire the maintenance expertise to deal with the new technology? If so, what are the effects on our present maintenance system? Will second line electronic maintenance still be required? Should a modern maintenance system be created or our present system be revised?

These questions and others are waiting for answers from senior management in Ottawa. Answers are needed today because tomorrow may be too late for the equipment we presently have and will receive in the future.

From Force Mobile Command

Dedication of Centurion Armoured Recovery Vehicle

On 27 June 1990, BGen L.W. MacKenzie, Base Commander, CFB Gagetown, accepted a Centurion Armoured Recovery Vehicle on behalf of the Military Museum, CFB Gagetown. The monument was presented by BGen J.I. Hanson, DGLEM, EME Branch Advisor in memory of the dedication and devotion of the RCEME, LORE and EME Craftsmen, Artificers and Officers who served in support of land operations in peace and war since 15 May 1944.

This monument was presented in a ceremony held in conjunction with the Base Maintenance Company Change of Appointment Parade. Supported by a 100-man guard from Base Maintenance Company, CFB Gagetown, the presentation ceremony was attended by approximately 150 spectators. With only a few "parking" problems, the Armoured Recovery vehicle was driven onto the monument pad in true RCEME fashion by Warrant Officer (Retired) Trapper Allen and commanded by Chief Warrant Officer (Retired) Bernie Hynes (the Silver Fox), both ex-RCEME personnel now living in the local area.

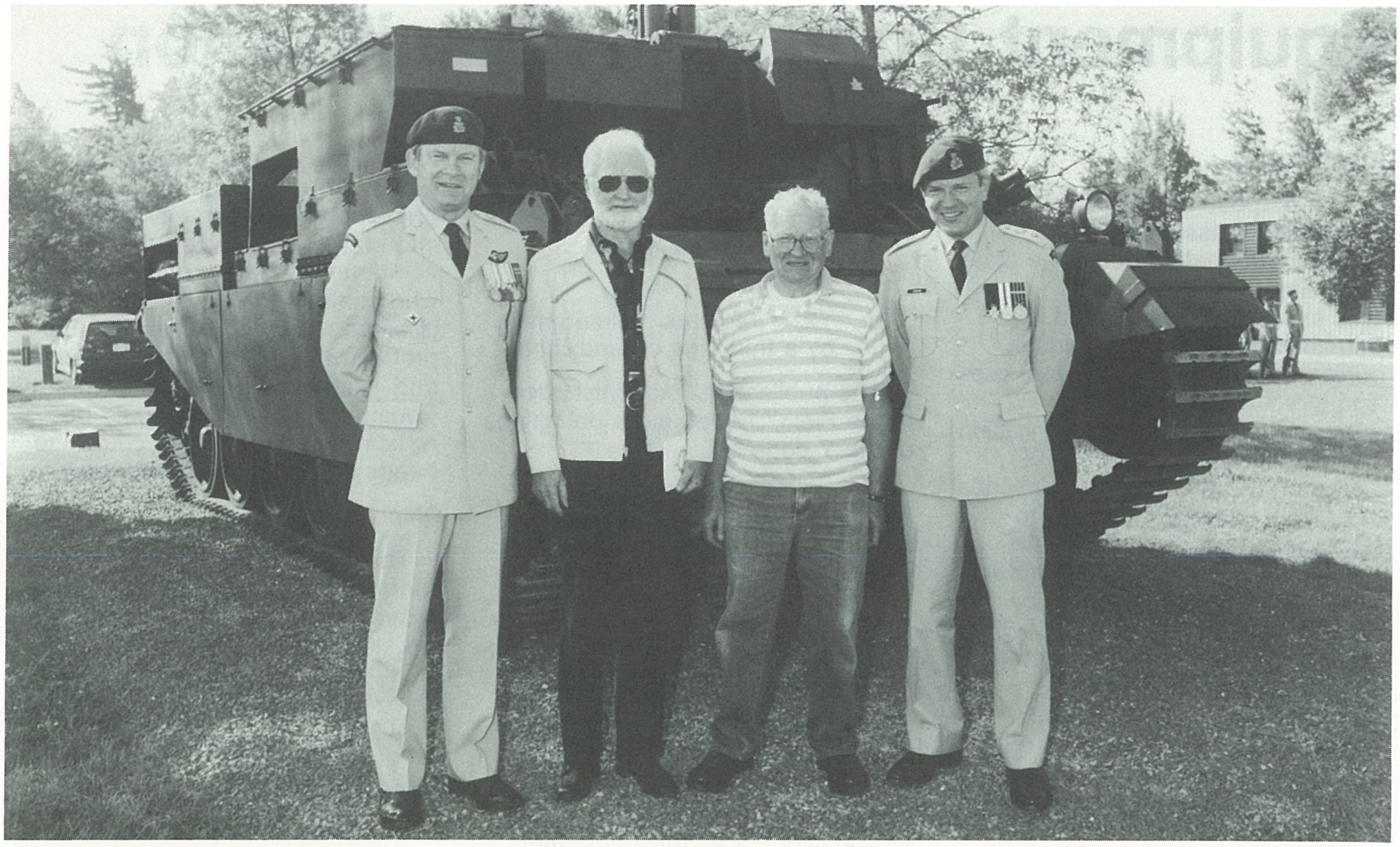
Bernie Hynes left the military in 1979 after 37 years of service having served in England, Italy, France, Belgium, Holland, Egypt, Cyprus, Borden, Churchill, Kingston, Saint John, Montreal, Moncton and Gagetown. He was first introduced to the Centurion tank in Kingston in 1956 and was responsible for the maintenance of the Centurion fleet in Germany where he was the OIC Forward Repair Group from 1961 to 1964. After nine years in Gagetown, Bernie retired as the ETSM of Base Maintenance Gagetown.

Centurion Armoured Recovery Vehicle being driven onto the monument site at the Military Museum by CWO (Retd) B. Hynes (Comd) and WO (Retd) T. Allen (Driver).

Trapper Allen retired in 1972 after 27 years in the military having served in England, Italy, France, Germany, Holland, Korea, Cyprus, Egypt, Wainwright, Calgary, Winnipeg, Saint John, Halifax and Baffin Island. Trapper has been involved with recovery on different occasions. In Korea, he was doing recovery on the Sherman ARV and received the medal of Military Merit. He was first introduced to the Centurion ARV while serving with the LDSH(RC) in Calgary. He retired as the WO ETQMS for 2 Field Engineers in Gagetown in 1972 but remained working as a VHE 09 at Base Maintenance Gagetown until he retired fully in 1987.

The Centurion Armoured Recovery Vehicle entered service with the Canadian Army, 27th Brigade, at Hannover Garrison in West Germany in 1951. The Centurion remained in service with the Canadian Forces until 1978.

This particular Centurion Armoured Recovery Vehicle, CFR 54-81328, was used by various units in Gagetown from 1956 until 1978. These units included 8 Canadian Hussars, The Royal Canadian Dragoons, 3 Field Workshop Royal Canadian Electrical and Mechanical Engineers, 7 Company Royal Canadian Electrical and Mechanical



Shown from left to right in front of the Centurion Armoured Recovery Vehicle Monument: BGen L.W. MacKenzie, Base Commander CFB Gagetown, CWO (Retd) Bernie Hynes, WO (Retd) Trapper Allen and BGen J.I. Hanson, DGLEM, EME Branch Advisor.

Engineers, 3 Experimental Brigade Service Battalion and finally with the Armoured Vehicle Platoon of Base Maintenance Company K-18.

In 1985, work was started to refurbish the vehicle. From the start, it was intended to drive the ARV onto the monument pad and work began in ernest as the dedication date grew closer. Approximately 100 hours of labour was put into the vehicle by the Engineering Equipment Section and Materials Platoon of Base Maintenance Company Gagetown in an attempt to put the vehicle into roadworthy condition.

A number of problems were encountered by the refurbishment team not the least of which was a lack of parts. Previously frozen and split coolant nails were bypassed by means of a pipe passing under the hull. This was necessary due to the lack of room between the engine and hull. General Motors Cooling System seal tabs were used as a temporary solution to burnt "O" rings in the coolant tubes and the fuel tanks and engine compartment were flushed because they were full of sand from the sand-blasting.

A well done is extended to MWO Mulholland and his dedicated team who put so much time and effort into ensuring that this Centurion Armoured Recovery Vehicle could be driven to its last resting place as befits a RCEME vehicle.

The Centurion Armoured Recovery Vehicle monument is now on permanent display outside of the CFB Gagetown Military Museum.

by Captain D.L. Wood

Base Maintenance Company

Canadian Forces Base Gagetown

Centurion Armoured Recovery Vehicle Particulars

Weight — 50 tons

Top Speed — 21.5 mph (34.6 kph)

Range — Road: 118 miles (190 km)
Cross Country: 65 miles (104 km)

Winch Capacity — Single Line: 30 tons
Max with Winch Blocks: 100 tons

Towing Capacity — 50 tons

Main Engine — Rolls Royce Meteor Mk IV B 12 Cylinder Gasoline Engine producing 658 BHP at 2250 rpm

Equipment Condition Classification

Introduction

The purpose of Equipment Conditions Classification is to transmit information about the state of readiness of equipment. This information is intended primarily for use by operational commanders. Maintainers also use it to direct casualties to the appropriate maintenance organization. The familiar letter codes of "X", "Y" and "Z" are in use to describe the extent of repairs needed to return a casualty to service. An equipment casualty which did not justify recovery, backloading or repair was identified as "BR". The letter "S" was later introduced to classify an equipment as serviceable. Unfortunately the meanings of the letter codes are no longer understood by maintenance personnel or operators. The years and subsequent rewrites of manuels have left the condition classification system in a state of confusion.

Background

In 1973 there was a classification system of equipment condition broken down as follows:

a. serviceable;

b. repairable; and

c. condemned or BR.

To be consistent with a QSTAG in effect at that time, Repairable could be further described by the letters "X", "Y" and "Z". Those codes were defined as:

a. X CASUALTY — requires repairs up to unit capability;

b. Y CASUALTY — requires repair up to the capability of second and third line workshops; and

c. Z CASUALTY — requires repair up to the capability of a base workshop.

Further to this the Y code was defined by maintenance doctrine as:

a. Y1 — requires maintenance by a second line organization; and

b. Y2 — requires maintenance by a third line organization.

The publication "Administration in the Field" added more definitions of the Y code as:

"Y" — The item can be made serviceable by intermediate level repairs usually within:

a. 12 hours by second line mobile Repair Teams (MRT),

b. 24 hours by second line Main Repair Groups (MRG), and

c. 7 days by third line facilities or organizations.

In addition to this first appearance of the time-to-repair element for code definitions, there are two more classifications of casualties that were introduced in "Administration in the Field". Though they are suitably defined and have a logical rationale, their current validity is doubtful. They are:

a. BLR — Beyond local repair due to a lack of spares, tools and other resources or due to a lack of time; and

b. BER — Beyond economical repair under current regulations.

As seen, there are several definitions for the "Y" and "BR" code, none of which agree. More importantly, the definitions for Equipment Condition Codes do not give operational commanders information as to where his equipment is being repaired and who controls the equipment when it is being repaired. To resolve this problem the ADTB (Army Doctrine and Tactics Board) decided that the Equipment Condition should be redefined to take into account the needs of operational commanders.

Discussion

There are four situations confronting the operational commander when he is examining the status of his equipment:

a. case 1 — the unit's equipment is serviceable and ready for use;

b. case 2 — the unit retains control of the equipment while repairs are being effected;

c. case 3 — the unit loses control during the repair but the equipment is returned on completion; and

d. case 4 — the unit loses the equipment but is entitled to a replacement.

First the letter code "S" indicating serviceable equipment poses no problem. It indicates the first case where the unit's equipment is ready for use.

There is apparently little difficulty with "X" classification of a casualty. The dedifinition is reasonably clear and both user and maintainer understand the equipment will not leave the direct control of the user unit. The casualty can, and will be repaired with unit resources.

There is only a minor amendment to the definition required to indicate the location of the casualty.

There are major difficulties with the "Y" code. The "Y" code covers cases 3 and 4. If second line repairs are required then the unit no longer has direct control of the equipment but the equipment will be returned when the repairs are completed. If third line repairs are required then the equipment is struck from the unit's charge and becomes part of Supply stock. Clearly one code cannot accommodate this situation and two codes will be required to cover each case.

There is little difficulty with the "Z" code as the commander loses the equipment but is entitled to a replacement.

The code letters "BR" — beyond repair, "BER" — beyond economical repair and "BLR" — beyond local repair are redundant. They provide no additional information to that which is apparent when a casualty classification changes from "X" to "Y" to "Z", and therefore should be eliminated. "BER" can be of value to senior levels of management when comparing physical problems of equipment replacement with repair costs. However, it does not tell the operator anything of significance to this operation, and has no place in a field oriented classification system.

The letters "BR" remain to be examined. This code has the advantage of familiarity, being recognized as meaning beyond repair or comdemned. There is some utility in retaining "BR". To be classified "BR" a casualty would automatically fall into the fourth situation a unit would be faced with; they lose the equipment. More significant to the maintainer, no time, effort or resources need be wasted on the casualty classed as "BR".

As discussed the "S", "X" and "Z" codes cover situations 1, 2 and 4 respectively. Situation 3 is not covered by any single code as the "Y" code covers both case 3 and 4. To give case 3 its own code elements the "Y" code definitions need to be amended. This amendment will shrink the definition of the "Y" code so it covers case 3 only, the casualty requires repairs up to the capability of a second line workshop and equipment ownership is retained by the unit.

This leaves the remaining element of the "Y" code. When the repairs required by an equipment are beyond second line then the equipment falls into the fourth situation, the unit loses the equipment. This is the same situation as the "Z" code. Therefore all repairs that are beyond the capability of second line can be coded as "Z".

Concluding material

As a result of the discussion, the following definitions of Equipment Condition Codes were agreed to at the twenty fourth meeting of the ADTB:

a. S — serviceable;
b. X — an equipment casualty requiring repairs that are within the capability of a first line maintenance organization. The unit retains ownerships and control of the equipment.
c. Y — an equipment casualty requiring repairs that are within the capability of a second line maintenance organization. Equipment ownership is retained by the user unit;
d. Z — an equipment casualty requiring repairs that are beyond the capability of a second line maintenance organization. Equipment ownership is transferred to Supply and the user unit is authorized to demand a replacement;
e. BR — beyond repair; and
f. BER — beyond economical repair under current regulations. This will include items for which movement costs would be excessive. (Note: this code is of value to senior management only. It should appear in CFP 314 (1) but in no other manual).

Now that Standard Equipment Conditions Codes have been established and have been approved by the ADTB at the twenty fourth meeting, the definitions should be included in new doctrine manuals as they are reviewed during the next cycle.

LEME Militia Career Profile

Presented by: SO2 Maint Tech SP,

THE AIM OF THIS ARTICLE IS TO INFORM YOU OF THE LATEST DEVELOPMENTS IN THE LEME MILITIA CAREER PROFILE DEVELOPED TO IMPLEMENT THE TOTAL FORCE CONCEPT.

Events leading to the development of the revised LEME Militia Career Profile

The establishment of the total force concept brought the issue of the Militia capability to effectively perform its new tasks. Keeping this in mind it becomes evident that if the Militia units and individuals are to properly fulfill their responsibilities toward the new structure, they must be trained to the same level of skill and knowledge as their regular counterparts. The one task, one standard principle must be applied. The present CTS under the MITCP 85 allows the Militia technician to be employed at the assistant craftsman levels, a level inferior to the reg force technician. The MOB specs for the LEME trades were rationalized and those identified as open on Figure 1 were retained for total force employment (Figure 1).

TOTAL FORCE LEME TRADES

SUB-MOC	TRADE	TOTAL FORCE STATUS
M411A	VEH TECH — WH	OPEN
M411B	VEH TECH — TRK	OPEN
M411C	VEH TECH — EE	OPEN
M411D	VEH TECH — AAGSE	CLOSED
M411E	VEH TECH — REC	OPEN
M421A	W TECH L — SA	OPEN
M421B	W TECH L — ARTY	OPEN
M421C	W TECH L — AFV	OPEN
M421D	W TECH L — SECCONT	CLOSED
M431A	ELM TECH — GEN	OPEN
M431B	ELM TECH — AUTO	OPEN
M431C	ELM TECH — MAC	CLOSED
M431D	ELM TECH — OM	CLOSED
M432A	FCT ELEC — GEN	OPEN
M432B	FCT ELEC — ARMD	OPEN
M432C	FCT ELEC — ARTY	OPEN
M432D	FCT ELEC — MSL	OPEN
M433A	FCT OPTR — OPT INST	OPEN
M433B	FCT OPTR — ARMD	OPEN
M433C	FCT OPTR — ARTY	OPEN
M433D	FCT OPTR — MSL	OPEN
M433E	FCT OPTR — SVY INST	CLOSED
M441A	MAT TECH — WELD	OPEN
M441B	MAT TECH — MACH	OPEN
M441C	MAT TECH — AUTO BODY	OPEN
M441D	MAT TECH — PAINT	CLOSED
M441E	MAT TECH — LAB CARP	CLOSED
M441F	MAT TECH — TEX	OPEN
M441G	MAT TECH — SMW	CLOSED

FIGURE 1

In order to correct the A/M handicap, LEME Militia trades were compared to those of the regular force. Meetings were held between CFTSHQ and FMC HQ TRG staff to plan and produce integrated Occupation Specification (OS) and Course Training Standard (CTS). A board convened 5-16 Feb 90 and at that time the OS and CTS for the VEH TECH (WHEEL) SUB MOC M411A was produced. The CTS was also used to firm up the LEME NCM Militia career profile.

Career Profile Development

The general LEME Militia career profile developed consist of a structured mix of GMT and Technical Training (Figure 2). Roughly more than one third (30%) will be devoted to formal general military training (GMT).

One shortcoming with this progression that may not be too obvious is, that contrary to their regular force counterparts, LEME Militia technicians do not necessarily work in their tech field after and in-between their technical courses. The retention of hands on skills must continue up to the rank of WO. To alleviate this problem a technical refresher training program similar to a recurring OJT program is proposed.

Now lets look at each option developed by the CTS board.

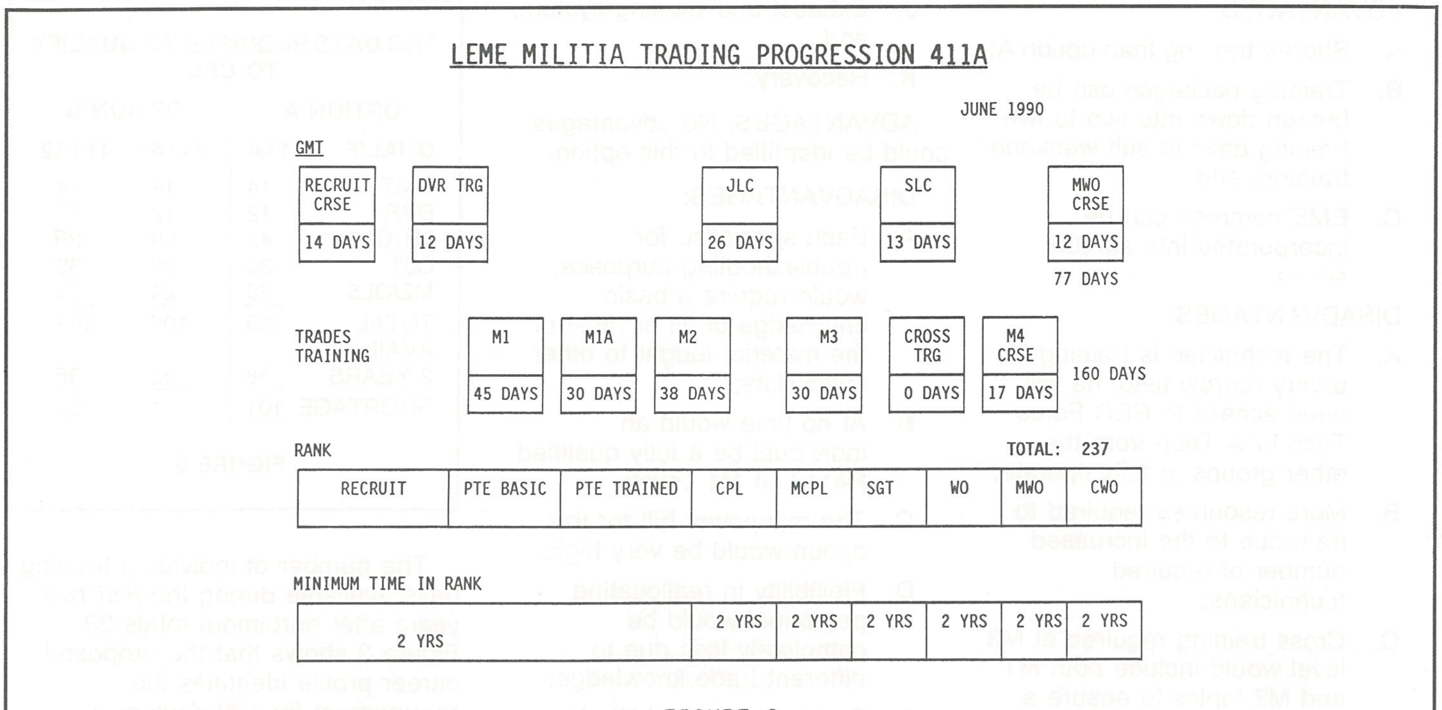


FIGURE 2

Option A — Full Mobilization Specification

DESCRIPTION. The full mobilization specification option will prepare a fully qualified technician with a career progression parallel to the regular force. This option consists of a 45 day M1 course, exclusive of GMT and DVR training, covering the theoritical basis and essential practical portions required by the craftsman. This course can be taught in modular fashion, each module covering eight to fifteen days of training. To complete the practical aspects of training not included in the M1 course it must be followed by the M1A twelve months OJT program (min 30 days) required. M2, M3 and M4 courses are required as detailed in the career profile to complete the technical training of the craftsman.

ADVANTAGES:

A. Provide a qualified technician on theory and essential practical training of the trade at M1 level for one of the SUB-MOC;

B. Meet the "One Task, One Standard" principle enabling Militia techs employment in total force units;

C. R411A can integrate with A QL 3 in his limited field of expertise;

D. EME common and common technical modules can be conducted at home unit (can also apply to R411B and R411E);

E. Ready packages can be designed into 2 to 5 training days sub-modules which could suit weekend training; and

F. EME common training can be integrated into all 400 series.

DISADVANTAGES:

A. Possibility of sub-standard training if not conducted at the schools;

B. Difficulty in obtaining qualified instructors at unit level;

C. Difficulty in obtaining all necessary training aids for unit level training;

D. Increased staffing needs to control and/or conduct training; and

E. Narrower field of employment compared to his regular force counterpart.

Option B — Sub-Mobilization Specification

DESCRIPTION. The sub-mobilization specification option was specifically designed to cut, to its minimum, the number of training days the Militia person has to take to become a qualified technician. It consists of the R411A POs divided amongst two groups: R411A1 (Engine and Automotive) and R411A2 (VEH Electrical, Transmission and Power-train). Each SUB-MOC in this option needs to take formal on job training as for option A. Also, cross TRG would be REQR at the SGT level.

ADVANTAGES:

A. Shorter training than option A;

B. Training packages can be broken down into two to five training days to suit weekend training; and

C. EME common can be incorporated into all 400 series.

DISADVANTAGES:

A. The technician is training in a very narrow field, he will need access to REG Force Tech or A Tech from the other groups to fully operate;

B. More resources required to train due to the increased number of required technicians;

C. Cross training required at M3 level would include both M1 and M2 topics to ensure a fully qualified R411A at the supervisory level;

D. Training difficult to be conducted parallel with the regular force;

E. More technicians are required to perform maintenance responsibilities;

F. Employment opportunity and personnel allocation flexibility restricted due to reduced scope in knowledge and skills; and

G. The same disadvantages in conducting training at unit level as indicated in option A.

Option C — Specialist

DESCRIPTION. The specialist option was studied after the two other options. Specialist trades would have to be created in the following ten categories:

A. Gas engines;

B. Electrical;

C. Brakes;

D. Steering and Suspension;

E. Small engines;

F. Tune-ups;

G. Transmission/Powertrain;

H. Diesel engines;

J. Exhaust and Cooling system; and

K. Recovery.

ADVANTAGES. No advantages could be identified in this option.

DISADVANTAGES:

A. Each specialist, for troubleshooting purposes, would require a basic knowledge of all or most of the material taught to other specialists;

B. At no time would an individual be a fully qualified R411A at M1 Level;

C. The manpower bill for this option would be very high;

D. Flexibility in reallocating personnel would be completely loss due to different trade knowledge;

E. There is no possibility for trade progression past the working level even in his own field of expertise;

F. Training involved for these specialists does not include EME common and common technical which is a must for each individual regardless of which specialty is chosen; and

G. There is no significant saving in training time especially when compared with option B.

Time Available

After having considered the Tech training options we must look at how much time we have to conduct this training.

COS OPS (BGen Lalonde) briefed all FMC HQ officers on total force. He covered the typical number of individual and collective training days that could be expected from a Militia unit *in a given year*. We have twenty five days of *collective training* and nineteen days of *individual training*.

A militia person must be a Pte for *two years* prior to become a Cpl. This period adds up to fifty (50) days of collective training and thirty eight (38) days of individual training respectively. The minimum time in rank from Cpl to MCpl is two years and two years from MCpl to Sgt.

TRG DAYS REQUIRED TO QUALIFY TO CPL

	OPTION A	OPTION B	
QUALIF	411A	411A1	411A2
GMT	14	14	14
DVR	12	12	12
M1/QL3	45	29	25
OJT	30	30	30
M2/QL5	38	24	21
TOTAL	139	109	102
AVAIL IN 2 YEARS	38	38	38
SHORTAGE	101	71	64

FIGURE 3

The number of individual training days available during the *first two years* after enrolment totals 38. Figure 3 shows that the proposed career profile identifies the requirement for 139 days of individual training (GMT for 14, DVR for 12, M1 for 45, M1A for 30 days and M2 for about 38 days) for the same period. There is a shortage of 101 days of individual training to qualify a Militia person to Cpl in two years using option A. By using the R411A1 and R411A2 SUB-MOCs the shortage of training days equals 71 and 64 respectively. Furthermore, GMT and Driver training must take place prior to start technical training at the M1 level.

The shortage of 101 days for the M1, M1A and M2 training required in the first two years to promotion to Cpl from enrolment can only be achieved if the number of days required for M1, M1A and M2 training *are made available and dedicated to technical training during the summer training periods*. Note that the exact number of days can only be confirmed after the M2 and M3 boards have sat.

Option A qualifies a technician who can be employed along his regular force counterpart. This is not the case for option B technician who have more employment

REGULAR VS MILITIA (PROPOSED)

TRAINING DAYS REQUIREMENT

JOURS D'ENTRAINEMENT REQUIS

RÉGULIÈRE VS MILICE (PROPOSÉS)

ENTRAINEMENT TRAINING	RÉGULIÈRE REGULAR	MILICE MILITIA	% MIL / RÉG
EMG / GMT	158	77	48.7
TEC / TECH	355	160	45
TOTAL	513	237	46.2

NOTA : FCE (QL4) DE LA FORCE RÉGULIÈRE EXCLUS DES DONNÉES PUISQU'IL N'Y À AUCUNES COMPARAISON EN JOURS.

NOTE : REG FORCE OJT (QL4) EXCLUDED FROM DATA SINCE NO COMPARISON IN DAYS.

FIGURE/ILLUSTRATION 4

restriction due to his narrower field of knowledge. Option B technicians will need access to regular force or a tech from the other group to fully operate, which is not the case with option A technician. Furthermore, additional training resources are required to train Option B technicians since there is two SUB-MOCs to teach rather than only one. Therefore, option A is the SSO Maint preferred option.

Taking the preferred option and comparing it with current reg force trg (Figure 4) we can see that a significant reduction has been achieved. The LEME Militia technician will receive 48.5% of the regular force GMT as done for all other militia soldiers. The Militia technician will receive 45% of the tech trg given to the reg force LEME tech. As you can see we have sacrificed tech trg at about the same amount as GMT. The overall LEME Militia tech will then be trained at 46.2% of his reg force counterpart.

SSO Maint presented the proposed LEME Militia Career Profile to the Army Training Board Screening Sub-Committee in Apr 90 for approval. The board referred the proposal to COS OPS because the decision made for our trades would impact all CSS trades. COS OPS decided that a RESNCM program similar to the RESO program already in place for Militia Officers would be developed and implemented for the LEME Militia NCMs. Option B (sub-mobilization specification) would be the primary method of training LEME Militia NCM but option A (full mobilization specification) would also be developed as a secondary mean of LEME Militia NCM training. Therefore LEME Militia NCM will receive technical training (formal and OJT) during their first two summers of Militia life.
The technical training plan will be developed at FMC HQ in concert with DLES and CFTSHQ in Jan 91.

In the interim two CTS boards sat in Sep 90 and Dec 90 for militia veh tech trades and militia WPN tech trades respectively. These boards develop the CTSs for the R411A, A1 and A2, for the M2, M3 and M4 levels and all levels for the 411B, 411E, 421A, 421B and 421C. The boards will make recommendations of how to implement the technical refresher training concept. Other LEME Militia trades CTSs will be developed in the longer term. CFTSHQ will develop CTPs, MLPs and LPs based on these CTSs in time to carry out the first pilot course on the 411A trade at EMERS and in one Militia Area during Summer 91.

Conclusion

The Total Force is here to stay and the LEME Branch is leading the way to ensure that Militia technical training is meaningful so these Craftsman can be fully employed within our Reg Force Workshops. Proper training identification is only one piece of the Total Force puzzle but it is an important one. With properly trained Militia technicians Reg Force Workshop Commanders have an extra source of productive capacity which is badly needed in these lean days. Arte and Marte.

A More Interesting Recovery Task

Army of the West Welcomes HLVW!!!

by Lt A. Aitken

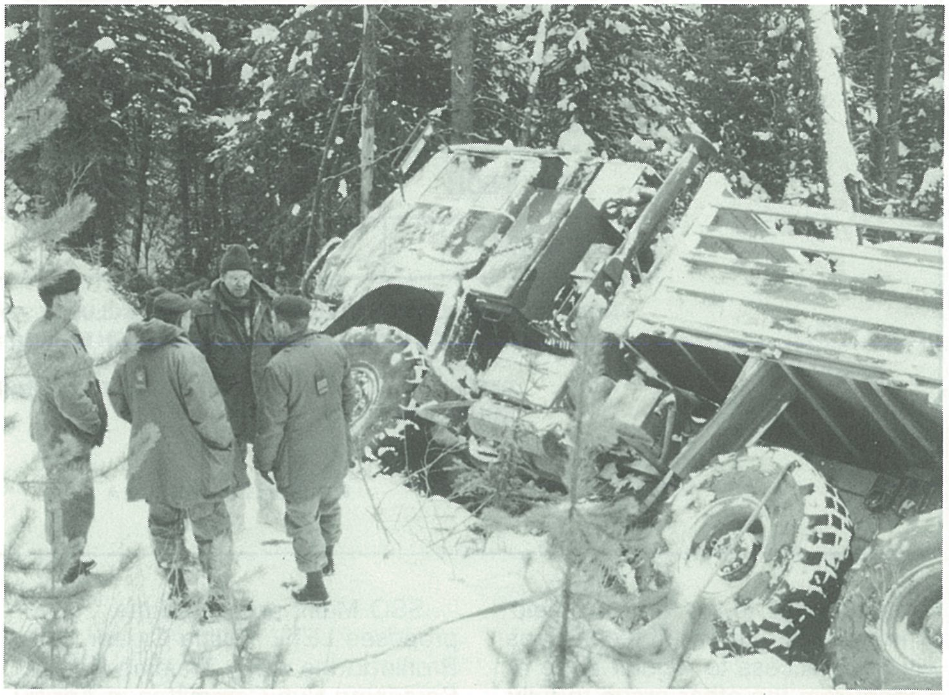
With the inception of our new HLVW, 1 Svc Bn's training mandate was a little different this year. HLVW quickly became everyones priority and by mid-November no one was left untouched by the numerous driver and maintenance courses vigourously in progress.

One of the many benefits of training in sunny Alberta is the challenging terrain offered by the foothills at the base of the Rocky Mountains. Here the truckers hone their skills and build their confidence and, as usual, Recovery Platoon silently brings up the rear often just to give a little nudge or tug and sometimes to drag "Buddy" all the way home.

Well today it wasn't quite that simple.

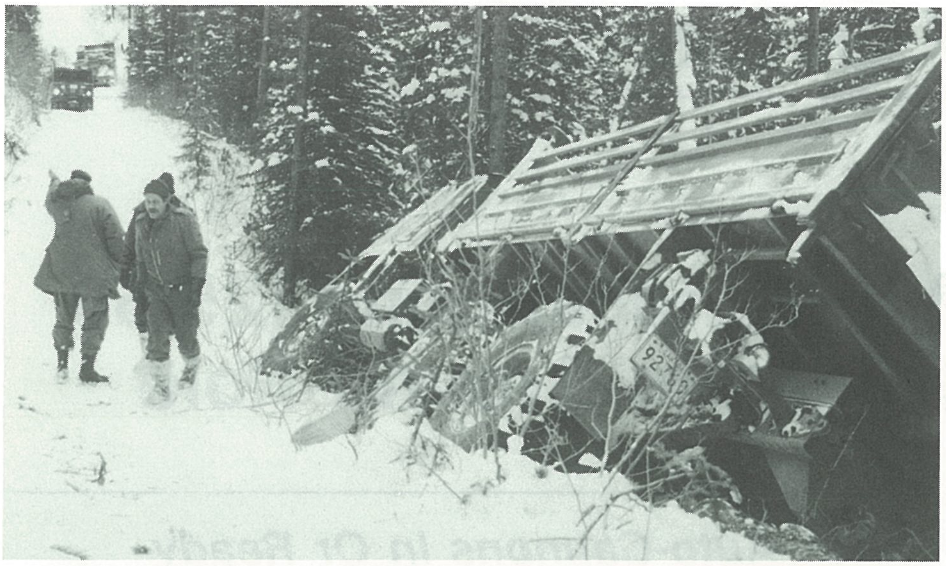
Fifty kilometres out of town and 12 km off-road lay the casualty. On initial inspection things really didn't look that bad. The site was a three metre wide dirt road precisely carved into the slope of a 55° hillside. The casualty was one of our brand new $100 000 10-ton baby trucks that had simply lost it's footing and slid off the narrow road only to be caught harmlessly, and held upright, by a strong, sympathetic tree.

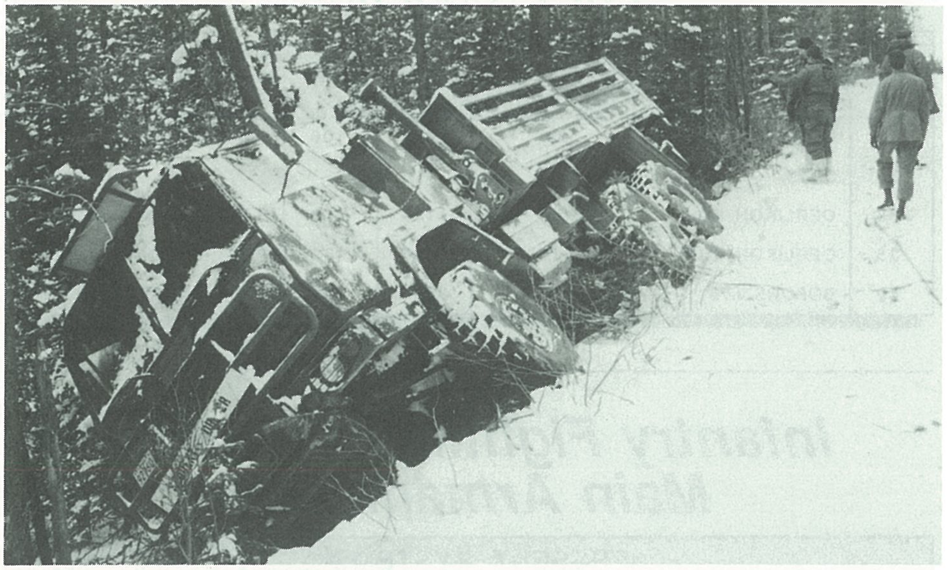
However, more thorough inspection and initial attempt to anchor the casualty to the steep mountain slope revealed some bad news: mountains are made primarily of rock and trees growing out of rock apparently have no roots — well, not deep ones anyway; the steepness of the slope was prohibitive to all vehicles and the road was too narrow to park alongside the casualty and accomplish anything constructive; the casualty could move neither



LCol Beselt is briefed on the situation by CWO Hogg and WO Johnston.

Cfn Byard, Cpl Barwitski and Cpl Leach dig the dead-man anchor.





CWO Hogg supervises the final touches on hookup.

forward nor backwards without trees being cut down; and the forestry department had become informed and expressed their concern for the welfare of their hill — i.e. no unnecessary tree cutting.

While we pondered the problem it started to snow.

Fortunately, Maintenance Company is not without extraordinary resources. Special expertise was required. Inevitably we solicited the help of our only original recovery technician, LEME's longest serving member, and our resident expert in all technical matters — CWO "Boss" Hogg.

At the start of the new day, weather conditions had changed dramatically. The only vehicles that could reach the casualty site, under their own power, were snowmobiles and BV 206s. CWO Hogg headed out with his assorted convoy that included a 5/4 ton truck, an ARVL, a BV 206, a tractor trailer, 2 × 5 ton wreckers, 2 snowmobiles and a dozen vehicle techs armed to the teeth with picks, axes, shovels, cable and chains. It took two days to dig the deadman anchor firmly into a very unaccomodating rocky mountainside. One more day and all the cable was laid, safety chains were hooked up (to prevent the casualty from rolling), and the recovery vehicles were in position. The recovery itself went very smoothly. A 3:1 indirect pull from the 20 ton winch on the wrecker was used. The deadman anchor easily handled the 17 ton initial strain and the HLVW slid back up, onto the road, without difficulty.

All in all it was a successful operation. Transportation Company was ecstatic to have their truck back, undamaged, and all the tradesmen involved in the operation learned how an apparently simple operation can become most difficult when weather conditions and terrain become overriding factors.

From DGLEM Directorates

DLAEEM

Medium Caliber Autocannons (25-50 MM) in the Ground-to-Ground Role

By Major K. Barnard

Many of us are familiar with small arms, tank guns, and artillery guns, but only a few of us are familiar with medium caliber auto-cannons (except in the air defense role). These cannons now form the majority of weapons being used as the main armament on infantry fighting vehicles (IFV) around the world (chart 1). The emersion of these weapon systems as support weapons for the infantry started in the 1960's with the introduction of the Marder mounting the 20-mm Rh202. Over the years cannons 20-mm to 35-mm have been used as the main armament on IFV's/IFSW (Infantry Fire Support Weapon).

Canada has been and still is dependant on the .50 caliber machine gun to defeat IFV's/APC's. With the introduction of the BMP1 in 1966 this has greatly reduced our capabilities. The .50 caliber does not have any effective capabilities against the frontal armor of the present BMP and very limited effect against the sides. An effort was made in 1983 to mount the LAV 25-mm turret on the M113 to be used as a IFSW. Although a turret was successfully mounted and tested, the program was cut for various reasons.

Chart 2 is a list of weapons that are either in service or type classified for service. The weapons listed in Chart 3 are under development. The following is a list of weapon and ammunition developments that will be ready for production in the 1990's:

1. The 45-mm Combat Vehicle Armament Technology (COMVAT)

Auto-Cannons In Or Ready For Production

CAL (MM)	*GUN MODEL*	*RATE OF FIRE (RDS/MIN)*	*WT (LBS)*	*LGTH (IN)*	*AMMO WT (LB)*	*COUNTRY*
25	BUSHMASTER M242	200	235	108	1.0-1.1	U.S.A.
30	2A42	200	?	?	?	U.S.S.R.
35	OERLIKON KDE	200	1124	168	3.3-3.6	SWITZERLAND
35	OERLIKON KDA	550	1200	174	3.3-3.6	SWITZERLAND
40	BOFORS L70	300	1256	159	5.5	SWEDEN.

Infantry Fighting Vehicles Main Armaments

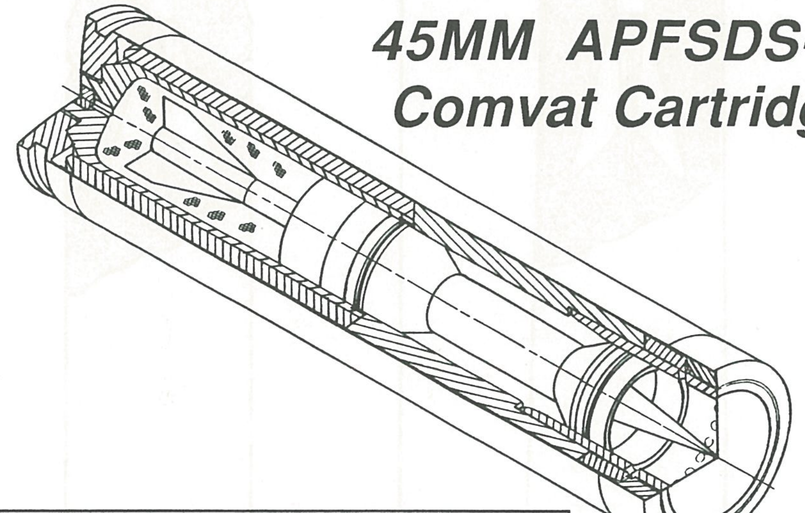
COUNTRY	*SYSTEM*	*WEAPON*	*CALIBER*	*YEAR*
PRESENT SYSTEMS				
FRG	MARDER	RHEINMETALL RH202	20MM	1969
U.K.	WARRIOR	RARDEN	30MM	1986
U.S.A.	BRADLEY	BUSHMASTER	25MM	1981
U.S.A.	LAV 25	BUSHMASTER	25MM	1982
U.S.S.R.	BMP2	2A42	30MM	1978/79
FUTURE SYSTEMS				
FRG	MARDER II	RHEINMETALL Rh 503	35/50MM	1997
JAPAN	IFV	OERLIKON KDE	35MM	1990/91
SWEDEN	CV90	BOFORS L70	40MM	1991/92
U.S.A.	BRADLEY*	UNKNOWN	45-50MM	?
U.S.A.	FIFV	UNKNOWN	45-50MM	?
U.S.S.R.	BMP3	UNKNOWN	>30MM?	1990

*BRADLEY BLOCK MOD III

Weapon Systems Under Development

GUN SYSTEM	STATUS
BUSHMASTER II	FULL SCALE ENGINEERING
RH503 50MM SUPERSHOT	FULL SCALE ENGINEERING
COMVAT 45MM	EXPLORATORY DEV
BUSHMASTER III 35/50MM	PAPER DESIGN/PROTOTYPE STARTED
G.E. 45MM CTA GUN	PAPER DESIGN
FRENCH XT2000 CTA GUN	EXPLORATORY DEV

45MM APFSDS-T Comvat Cartridge



CHARACTERISTICS

- ● LENGTH: 12.0 IN.
- ● DIAMETER: 2.75 IN.
- ● WEIGHT: 7.02 LBS.
- ● PENETRATOR DIA: 523 IN.
- ● PENETRATOR L/D: 14
- ● PENETRATOR WT: 454 gm.
- ● PROJECTILE WT: 748 gm.
- ● PROPELLANT WT: 632 gm.

using cased telescoped ammunition being developed by the U.S. Army.

2. The 35/50-mm Rheinmetall Rh503 using "Supershot" ammunition being developed for the West Germany Army.

3. The 35/50-mm Bushmaster III being developed by McDonnell Douglas.

4. APFSDS ammunition for the 40-mm Bofors L70, Oerlikon 35-mm KDE, 30-mm Rarden, and the 25-mm Bushmaster.

5. Electronically set time fuzes.

The development of the COMVAT and the Rheinmetall Rh503 systems represent a change in development philosophy. Formerly gun and ammunition were developed to be followed later with fire control and turret installation. Both of these systems include cannon, ammunition, fire control, feed system, and turret integration as part of the weapon system development program.

Combat Vehicle Armament Technology (COMVAT)

The COMVAT weapon system is a program being run at U.S. Army's Armament, Research, Development, and Engineering Center, Picatinny Arsenal, New Jersey. This program is developing a high performance armament system capable of defeating IFV's of the 2000+ timeframe for future combat vehicles. It's advantages over current automatic cannon systems include improved armour penetration, high first round hit probability, improved ammunition stowage, improved vehicle survivability, and an automatic rearm capability.

Specifically the COMVAT armament system includes:

1. A rapid-fire automatic cannon (45-mm) capable of firing a full family of COMVAT cased telescoped ammunition cartridges in single shot, and automatic fire.

2. A fully family of cased telescoped cartridges including HE-I, APFSDS-T, HETP-T, and APTP-T ammunition. COMVAT cased telescoped ammunition is characterized by its right circular cylindrical configuration with the projectile totally enclosed within the cartridge, push-through extraction, and low vulnerability (LOVA) propellants. Figure 1 illustrates the current developmental COMVAT APFSDS-T cartridge.

3. A full-up linkless feed and rearm system whereby all "stowed" rounds are, in effect, "ready" rounds.

4. An automatic rearm capability.

5. An advanced full solution fire control system for acquiring and engaging targets.

Cased telescoped ammunition was chosen by the U.S. Army because of its unique shape and use of high performance propellants which provide superior performance (armour penetration and time-of-flight) in cartridges that are approximately one-half the size of conventional rounds. As a result, for example, a 30-mm COMVAT round has the performance of a conventional 35-mm round in a case that is about one half the size. This feature facilitates maximizing the kills per stowed load for combat vehicle applications against future BMP threat targets.

Cased telescoped ammunition development is low risk. Many years of prior Air Force development has provided a substantial technology data base to draw upon. The Air Force is currently in advanced development of a 20-mm cased telescoped ammunition cannon for the future fighter aircraft.

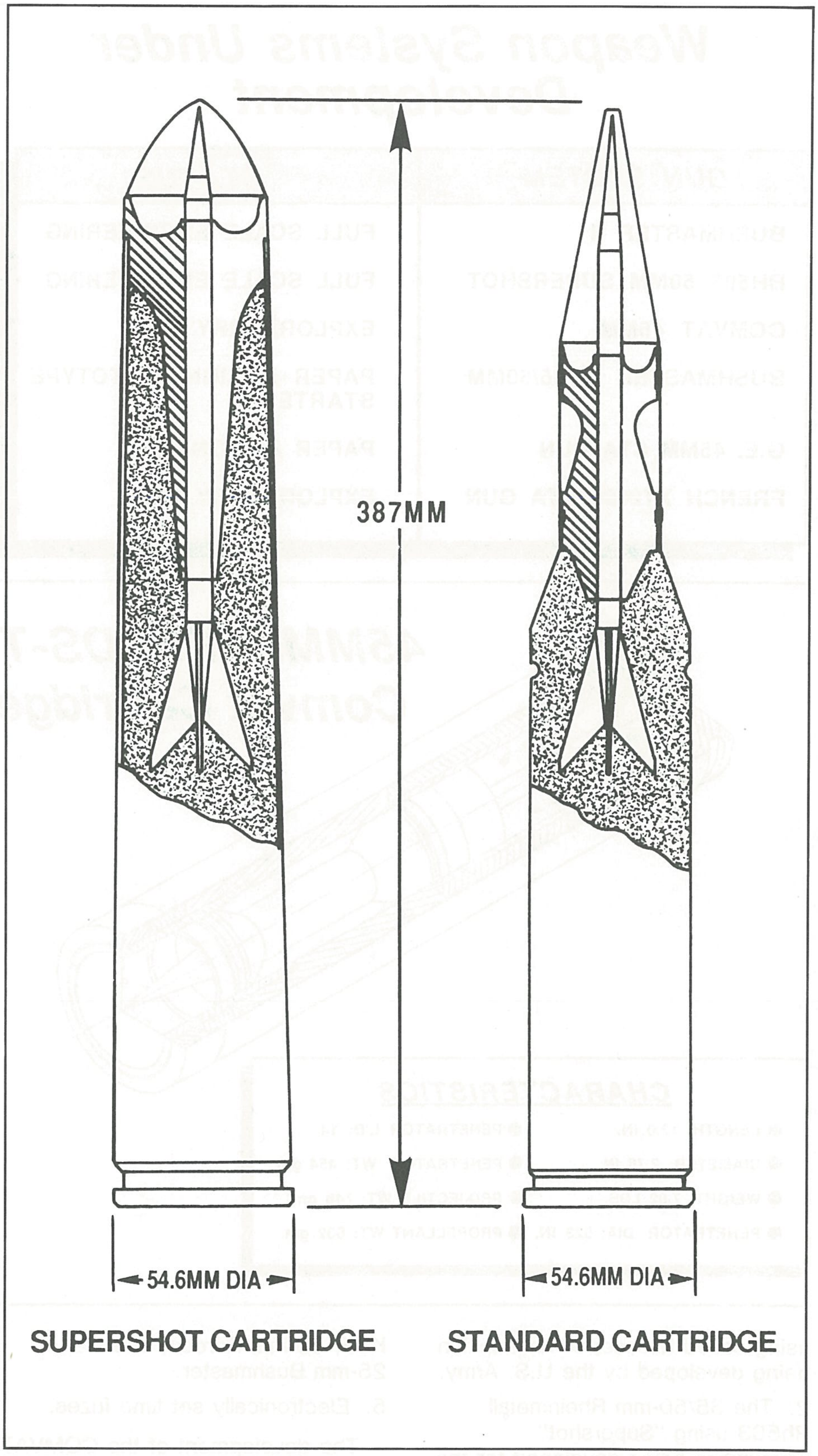
The unique cylindrical shape of cased telescoped ammunition lends itself to easy mechanization of automatic handling. Such technology already exists in the automatic handling of cylindrical containers. These developments will greatly aid in achieving an automatic rearm capability.

Rheinmetall Rh 503

The Federal Republic of Germany embarked upon an upgun program in the early 80's. At the completion of extensive terminal ballistic and behind armour effects testing using 25, 35, 40, and 60-mm weapons, FRG decided to develop the 35/50-mm Rheinmetall Rh503 autocannon. This cannon will be fielded with the Marder 2 in 1997.

The RH503 is an externally driven, 35-mm autocannon which has the capability of firing 50-mm "Supershot" ammunition with a barrel change.

"Supershot" is an ammunition design that is based on extending the case of a conventional cartridge well past the usual "bottleneck" region and using the added volume created for additional propellant. This additional propellant results in higher chamber pressures, higher velocities, and shorter times-of-flight. The cartridge design based on the 35-mm cartridge case results in a 50-mm bore diameter due to the very slight case taper and elimination of the necked area. Supershot rounds are fed, chambered and extracted in the usual manner. The only change required for the Rh503 to operate with 50-mm Supershot rounds is a barrel change. Figure 2 illustrates the design of a Supershot cartridge. The Supershot ammunition



cannot be used in all 35-mm cannons because the nose of the round cannot be used to guide the round into the chamber as in the Oerlikon 35-mm KDE. A complete Rh503 weapon system as concepted for the Marder 2 includes the following:

1. Rh503 35/50-mm automatic cannon with a barrel change capability to permit firing conventional 35-mm × 228-mm NATO ammunition or the 50-mm × 330-mm Supershot ammunition to be developed.
2. 35-mm APFSDS-T ammunition having superior performance to the 35-mm APDS round currently in production. This will be the near term AP round.
3. Dual linkless feeders with a planned capacity of 270-300 "ready" rounds.
4. Improved fire control including laser rangefinder, ballistic computer, and gunner's Thermal Imager (TI) remoted to the commander.
5. A two-man conventional turret with a 72" diameter turret ring.
6. Variable time fuzing for the HE round (this will be discussed in greater detail later).

Bushmaster III

Bushmaster III is a scaled up version of the McDonnell Douglas 25-mm Bushmaster which will be capable of firing both conventional 35-mm and 50-mm Supershot ammunition. The advantage of this system over the Rh503 is that the U.S. Army will be able to convert to a larger caliber with a minimum of impact on weapon training (especially maintenance since Bushmaster III is very similiar in concept and mechanism to the 25-mm version and shares some of the components). Initial firing of the Bushmaster III will be conducted in April 1990 in the single shot mode. A full up cannon capable of firing automatic is to be ready for the fall of 1990.

Bofors L70

The Bofors L70 is a modern version of the L60 anti-aircraft gun. The cannon has been turned upside down and a 24 round magazine has been added. An Armor Piercing Fin Stabilized Discard Sabot (APFSDS) round has been designed for the ground-to-ground role. The L70 will be used in the Swedish Combat Vehicle 90 (CV90) due for initial production in 1993/94.

APFSDS Ammunition

APFSDS rounds for tanks were initially developed during WW II. Work on medium caliber APFSDS ammunition began in the early 80's. The U.S. Army developed a tungsten long rod penetrator (which subsequently has been changed to DU) for the 25-mm Bushmaster and the British are developing a long rod for the 30-mm RARDEN. The 25-mm round is due to go into production in 1990.

Development of long rod penetrators for medium caliber was not a simple case of down scaling tank ammunition. Major problem areas were the fin design/drag, dispersion, and manufacturing tolerances. The G forces acting upon the projectile do not decrease, but the sabot and penetrator sizes are reduced. Length to Diameter (L/D) ratio had to be dropped because a penetrator with a quarter inch diameter and a L/D of greater than 20 acted like a long thin piece of plastic on launch.

Electronically Set Time Fuze

A new approach taken in recent years to improve the effectiveness of the HEI is the electronic set time fuze. This fuze is electronically set by the vehicle's fire control system as it is chambered or as the projectile exits the barrel. The fuze enables the detonation of the round in close proximity to the target. Against dug-in troops this could be 5 to 9 meters above their emplacements. This increases the effective footprint of the round because the forward momentum increases the horizontal burst pattern and the fragments, which normally are fired into the ground using a PD fuze, are now effective against the target. Analyses of using this type of fuze versus a PD fuze shows a tenfold increase in effectiveness. For example the probability of kill of prone troops in the open increases from .05% to .50% for a six round burst of 50-mm ammunition when a electronically set time fuze is used. Bofors has developed such a fuse for the L70 which is presently going through troop trials and is expected to be fielded in 1992. Germany has an requirement for this type of fuze in their Rh503 program.

Summary

Although Canada does not at the present time have a cannon employed in the ground-to-ground role it is required if the Canadian Forces expects to operate effectively against IFVs. It is our responsibility to stay abreast of developments in this area so that technical advice is readily available when the user community decides to fulfill this requirement for an medium caliber autocannon.

PMO LLAD Maintenance Training

Success Story in the Making

By Major Gord McAlpine, LLAD Training Coordinator

In 1986 the Canadian Government awarded a contract for a Low Level Air Defence System to Oerlikon-Buehrle of Switzerland. This contract called for "... equipment and related services to assure... defence against the threat of low level air attack."

A very significant portion of the related services included the training devices and associated training courses necessary to qualify personnel to operate and maintain the LLAD weapon system.

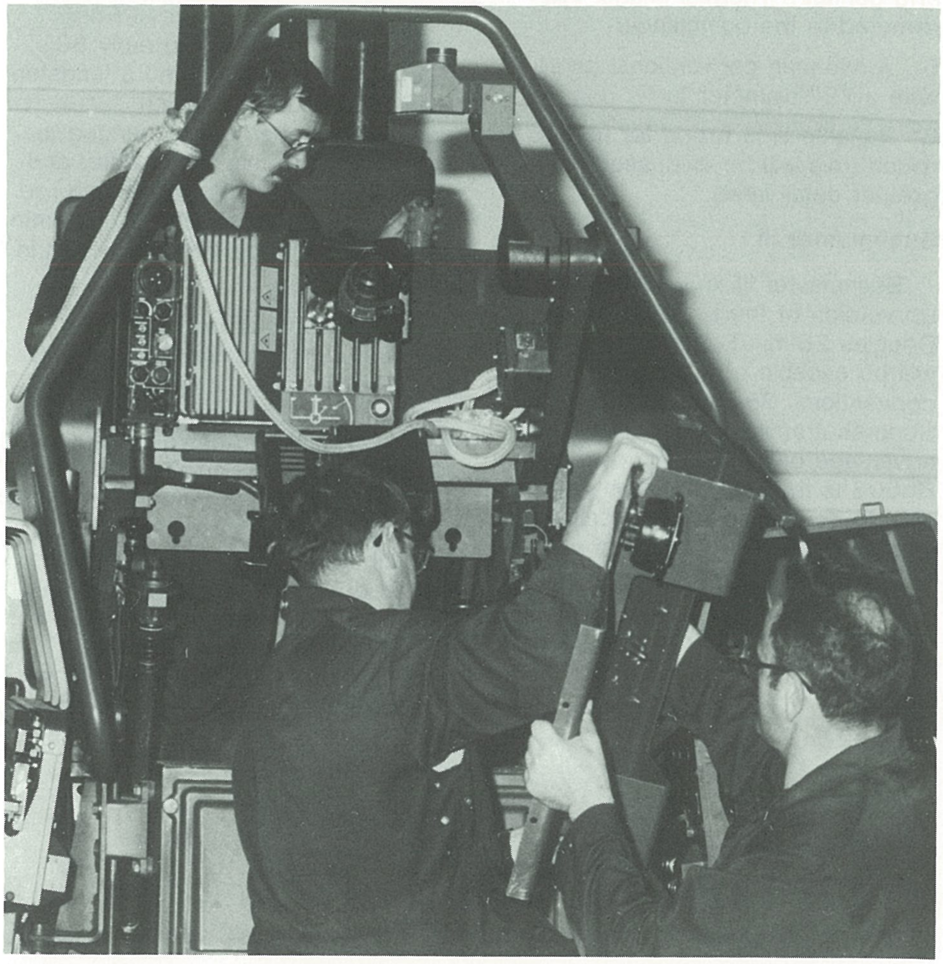
Maintenance training, now nearing the halfway point from a project perspective, is at its height. On any given day, up to seven courses of LEME technicians are learning the intricacies of these new weapon systems at Maintenance Training Battery of the combined EME and Air Defence Artillery School at CFB Chatham. As of December 1990, well over 200 students from either 4 Air Defence Regiment in Lahr, 119 Air Defence Battery at Chatham, or the School itself, will have undergone training.

The LLAD project maintenance training plan calls for 45 different technical courses — some with up to seven serials — to train technicians to perform level one and level two maintenance on the Oerlikon 35 mm Twin Gun, the SKYGUARD fire control system and the ADATS missile system.

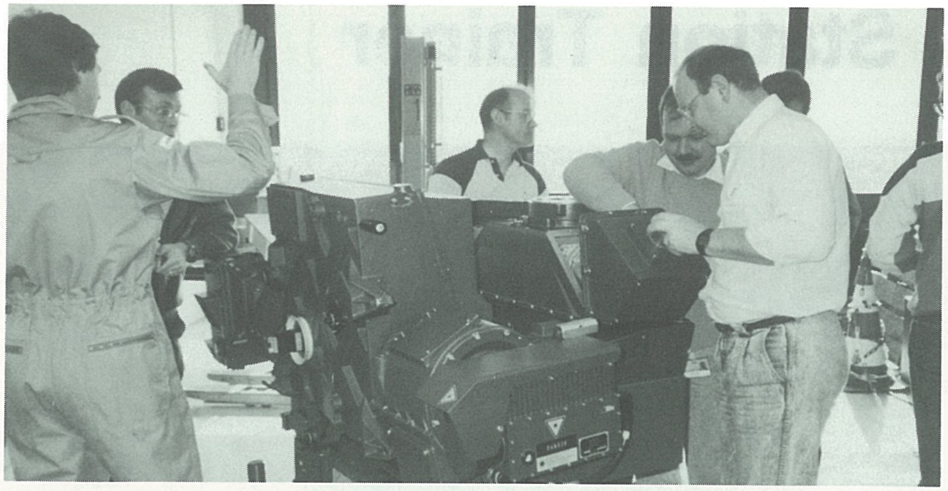
FCS technicians attend four, seven and twelve week courses on electronic maintenance for the Gun, SKYGUARD and ADATS respectively, as well as optronic maintenance courses for ADATS. In addition, they will be trained to maintain the state of the art air defence simulator known as the Crew Station Trainer (CST).

The eight week vehicle maintenance courses are designed to train vehicle technicians to maintain the PSU and the braking system of the Gun and the SKYGUARD, the ADATS primary power unit and the M113A2 vehicle. As well, they learn to perform mechanical and hydraulic maintenance on the SKYGUARD.

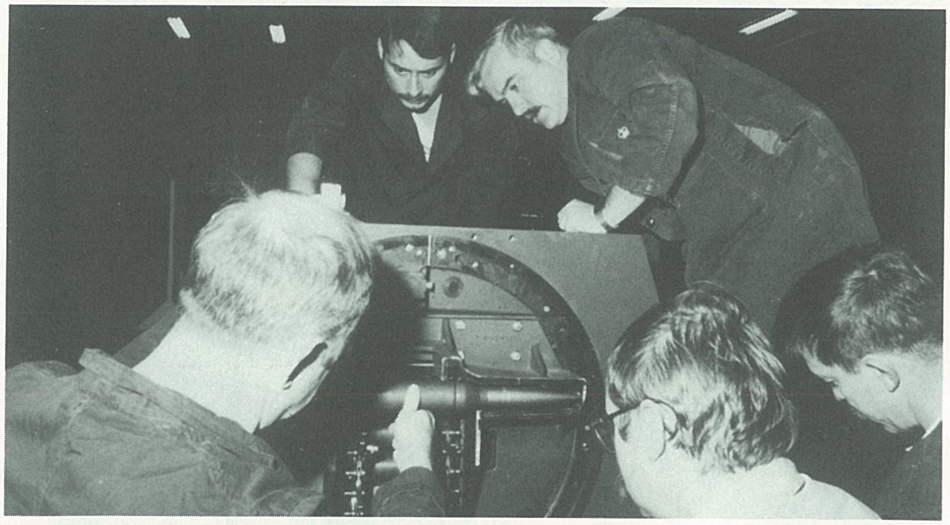
Six and four week mechanical and hydraulic maintenance courses are taught to weapon technicians on the Gun and ADATS.



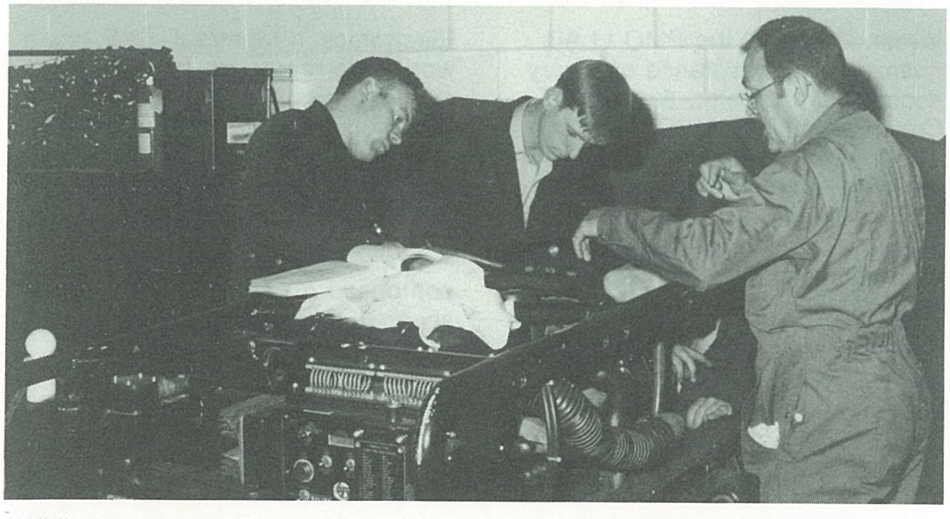
Sgt Kim Beatty sheds a little light on things as WO's Terry White and Al Blower finish replacing the Gun King Sight.



A typical scene from the SKYGUARD RADAR INSTRUCTOR course in Zurich; while WOs John O'Connell and Lorne Howard and MCpl Cal Thistle look away nonchalantly, WO AJ Taylor tries to divert the Oerlikon instructor's attention as Sgts Gerry Barriault and Charlie Lapierre begin "acquisition" of the first system.



Mr JP Fasana and WO Rick Leblanc look on as WO Ken Bell gives "thumbs up" to WO's Poulin and Denis Jackson.



"While you're here," preaches Veh Tech instructor WO Bob Lanteigne, "you'll do things by the book!"

Radar techs attend eight and/or six week courses on the ADATS and the SKYGUARD radars.

As radio technicians will maintain the new C^3 equipment which will be fielded as part of the LLAD project, four week maintenance courses will be conducted for them starting in 1992. Instructor training on the AN/TYC — 501, Digital Message Entry Device (DMED), will take place early in 1991 at Computing Devices of Canada.

Planning is well underway for the first live firing of ADATS beginning in May of 1991 at CFB Suffield. As a result, ammo technicians from all over will be sampling the Miramichi's famous Irish hospitality during the St. Patrick's season of 1991.

As was stated previously, maintenance training is currently at the half way point. This applies to the implementation phase of the Project only. The contractor is responsible for providing not only the instruction but also for the production of all training documentation in Canadian Forces format. Responsibility for teaching shifts from the contractor in the initial serial to all LEME instructors by the end of the fourth serial of each course.

At the managerial level, this strange marriage of civies, bird gunners and wrench benders has occasionally evoked scenes reminiscent of "The Honeymooners", but this relationship has improved, as has the product. The real reason for the success, however, is due largely to the professionalism on the part of the instructors, both from the Contractor and from the Air Defence Artillery School.

In the final analysis, the effectiveness of any weapon system is directly related to, among other things, the expertise of the maintainers tasked to support it. In the case of the low level air defence system, comprising the Army's most technically advanced weapons, every effort is being taken to ensure the maintainers hold up their end of the bargain. On the evidence thus far, there is no reason to believe they wont.

ADATS Crew Station Trainer

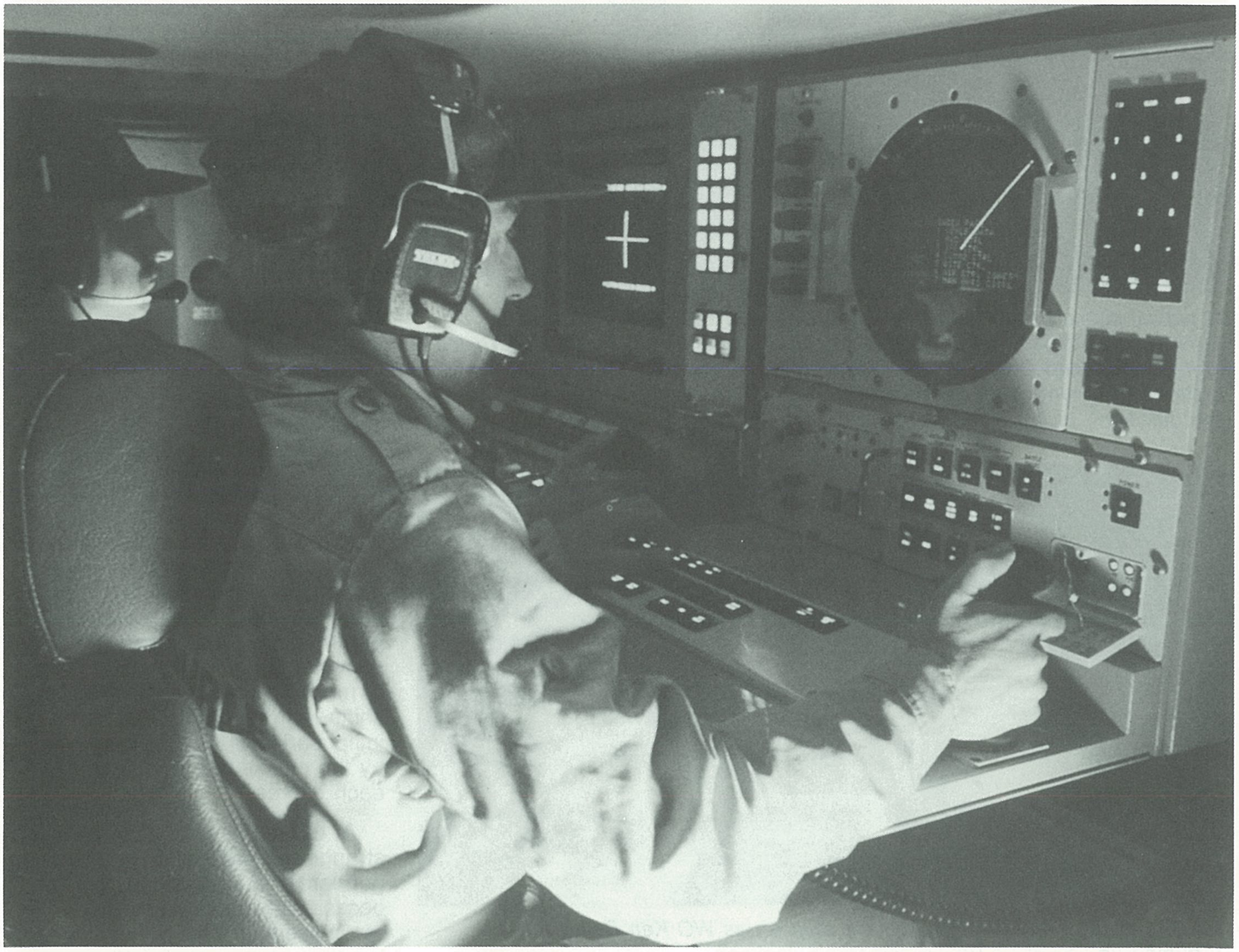


FIG 1 ADATS Radar and Electro-optic Consoles

Prepared by Maj J.Y.R. Côté

With today's increasing sophistication and cost of military equipment, the use of simulators for training has become an unavoidable cost effective solution. With the entry into service of the Air Defence Anti-tank System, (ADATS, Fig 1) the Artillery needed a reliable simulator to train operators at all levels. Recently, the PMO LLAD finalized the acceptance of a very successful simulator, the ADATS *Crew Station Trainer* (CST). The tremendous cost that would be involved in training people on a system like ADATS, without simulation, will make the CST an extremely effective and useful training aid.

Oerlikon Aerospace, the prime contractor for ADATS, subcontracted the CST to CAE Electronics in Montreal. CAE has a worldwide reputation for aircraft simulator systems and the new LLAD operator trainer is a state of the art. The U.S. Air Defence project has also shown a lot of interest in this equipment.

The CST is a simulator comprised of an instructor station, six crew stations, (Fig 2) a

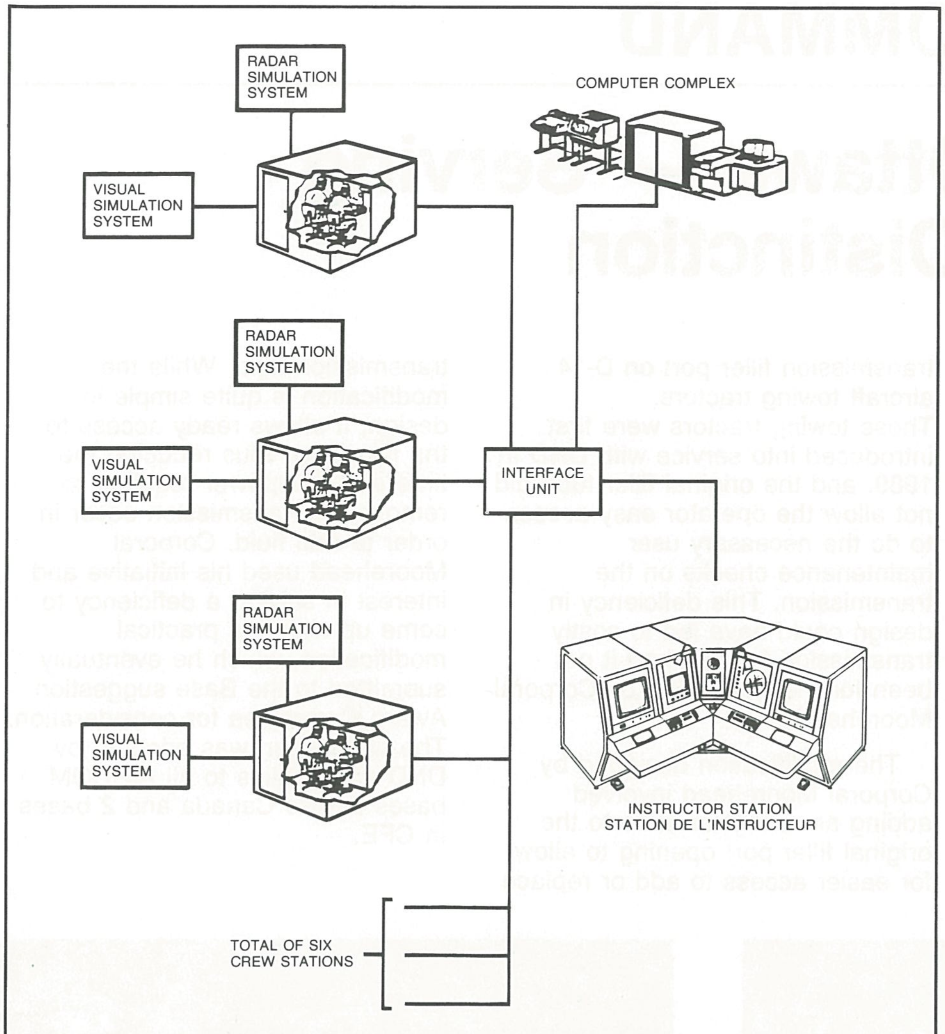


FIG 2 *Crew Station Trainer Configuration*

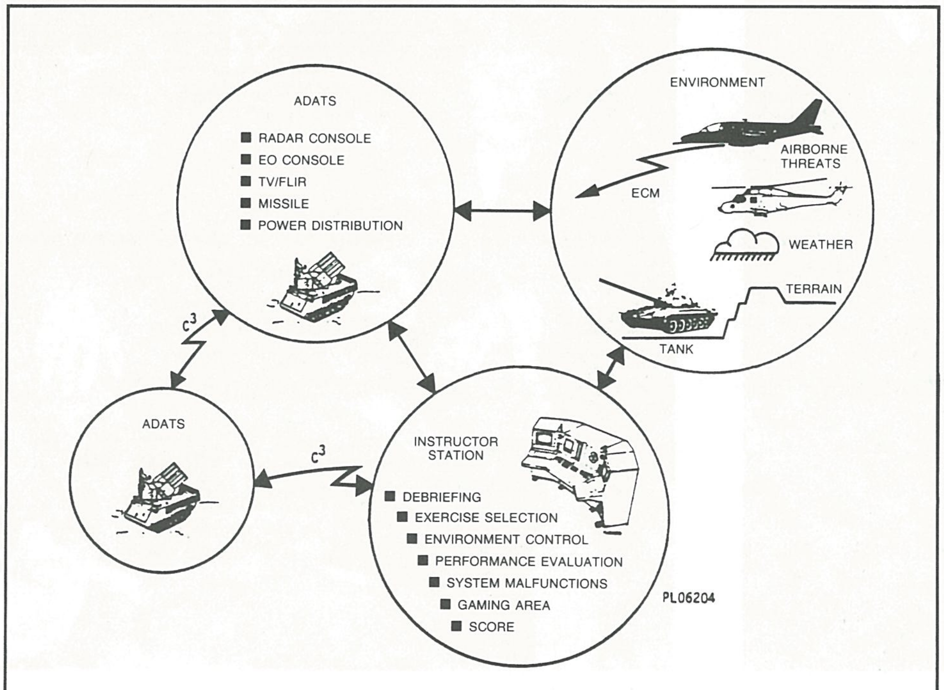


FIG 3 *Simulation Concept*

computer system and interface. Each crew station accurately simulates all the functions and indications of the Electro-optic and radar consoles of ADATS (Fig 3).

a. *Electro-Optic Simulation*. The system simulates the TV and Forward Looking Infra-Red (FLIR) tracking system, missile firing and engagement.

b. *Radar Simulation.* The CST simulates several types of fixed wing aircraft and helicopters approaching from any direction, speed, altitude and angle. It also simulates electronic counter measures with three types of jammers.

c. *Environmental simulation*. One of the main features of this system is its ability to simulate environmental conditions. The CST simulates sound, low visibility and adverse weather in both night and day conditions.

The instructor station enables the instructor to monitor individual crew stations, input different failure functions and change the weather conditions. The instructor station also includes different types of evaluation capabilities ranging from a simple CRT summary to a detailed printout of the students' progress.

This system will be used for all ADATS courses; basic training for operators and advanced training for Master ADATS operators.
The simulation software is so versatile and flexible that the ADATS operators will be able to train in all areas of operation, under all weather conditions without driving out of the hangar.

The CST will be installed in Chatham, New Brunswick at the Air Defence Artillery School by mid-October. It is anticipated that the CST will be operational in November 1990.

FROM AIR COMMAND

BEME CFB Ottawa — Serving With Distinction

by Lt C.K.A. Marsland

Suggestion Awards are a way of extending formal recognition to our military and civilian members who have shown superior levels of initiative and ability beyond their normal areas of responsibility. One such award was recently made to Corporal Robert Moorehead, a Vehicle Technician serving with BEME, CFB Ottawa. On 19 October 1990, a cheque for $ 400.00 and a suggestion Award Certificate were presented to Corporal Moorehead by the Base Commander Colonel C. Brando.

Corporal Moorehead's suggestion dealt with the relocation of the transmission filler port on D-14 aircraft towing tractors. These towing tractors were first introduced into service with DND in 1989, and the original filler tube did not allow the operator easy access to do the necessary user maintenance checks on the transmission. This deficiency in design could have led to costly transmission failures had it not been for the work done by Corporal Moorehead.

The modification designed by Corporal Moorehead involved adding an extension tube to the original filler port opening to allow for easier access to add or replace transmission fluid. While the modification is quite simple in design, it allows ready access to the filler port, thus reducing the time and manpower required to remove the transmission cover in order to add fluid. Corporal Moorehead used his initiative and interest in solving a deficiency to come up with this practical modification, which he eventually submitted to the Base suggestion Award Committee for consideration. The suggestion was adopted by DND and applies to all AIRCOM bases across Canada and 2 bases in CFE.

CFSAC 1990

CFB Ottawa entered a team into the Canadian Forces Small Arms Competition (CFSAC) for the 1st time this year. The team was made up of the following brave soldiers:

a. *from BEME* — Maj Nigel James, Sgt Denis Poirier, MCpl Steve Chipchase, Cpl Wayne Gork, Cpl Rob Moorehead, Cpl George Cummings, Cfn Stephean Korzeniewski, Cfn Stephane Smith, Cfn Matt Robinson and Mr Terry Mackey;

b. *from BCE* — Cpl John Dickerson; and

c. *from BAME* — Cpl Steve Byczyk.

At the start of the competition, those from other units who had attended many previous years noted that there were some "New Kids on the Block" but did not pay much attention as we were not expected to win anything; however, with the last competition on the first day CFB Ottawa won the Half-Section Match, which is a fire and movement section for minor units. Suddenly, Ottawa's name was being taken seriously.

We went to CFSAC 90 to learn, as well as compete, and if we won anything then that would be a bonus. Consequently we entered every event (except for the two fire movement matches for infantry battalions and Command Teams), some 40 different matches in all, covering the new C7 rifle and C9 LMP, the SMG, the pistol and the sniper rifle. This was more than any other Unit Team, in itself quite an accomplishment with only 10 firers.

Our results were, quite naturally, somewhat mixed. Against the infantry riflemen, who would have been equipped with the new C7 and C9 weapons for several years, it was an uphill battle as we were using borrowed weapons for three weeks; yet our best new rifle shot, Cpl Cork, finished in 56th position in the Canadian Forces. In addition to the early success in the Half-Section Match, our SMG team (Maj James, Sgt Poirier, MCpl Chipchase and Cpl Moorehead) won a combined event and Maj James must have shot straight on one day at least, as he won an individual prize.

In another elimination match, the Ottawa "B" Team were beaten by 3rd Bn PPCLI "A Team", whilst our "A" Team beat Maritime Command "B" easily, then Maritime "A", also easily. Eventually the gallant Ottawans were defeated narrowly in the semi-final by the same team who had beaten Ottawa"B". It is interesting to note that both Ottawa teams were beaten by the eventual winners — 3 PPCLI "A". Following that demonstration, Ottawa suddenly had a name with which to be reckon and it was noted that many infantry battalion recruiting Sergeants were busy offering inducements for remustering.

The final day heralded the most important competition — the Soldiers Cup for the major units (9 in the section) and the Fire Team Match for minor units (4 in the half-section). The competition is basically a two mile run in full equipment with weapons and ammunition, followed by a rapid and demanding attack on enemy position. The CFB Ottawa/BEME Team was comprised of (L to R): MCpl Chipchase, Cfn Korzeniewski, Cfn Foreman and Cfn Robinson. Success was theirs by hard work, training and much determination.

FROM CFCC

Alert: The Winter Playground of Ellesmere Island

CFS Alert is located approximately 817 km south of the geographic North Pole on the northern tip of Ellesmere Island. The average yearly temperature is −18.2°C along with a yearly snowfall of 23.9 inches. These figures do not portray Alert as the freezing Arctic out posts that the termer knows it to be. For six months, this isolated station is shrouded in a shadow of darkness and temperatures reach −80°C with the wind chill. In CFS Alert, the worst duty any tech can get is recovery in the winter. It makes even the young techs feel old. During the summer season, outdoor working conditions are somewhat more favourable as temperatures rise to around the zero mark. Naturally, this is CFS Alert's busiest period.

The EME organization on the station starts with the SLogO (Capt Log), StnO (WO Transport), SMaintO (EME Sgt) and one or two MCpls EME and three or four Cpls EME with EEM/AAGSE qualifications. The number of vehicles established in Alert is 73 all types, but it is important to note that 78% of these vehicles are Special Purpose Vehicles (SPV) and in several cases modified to suit the rigorous terrain and climate conditions of the Arctic. The newest vehicles to our fleet are two tracked fire vehicles FTV 2500 designed solely for their role in Alert. The fire fighting package is manufactured by WALTEK and its power train is a GV92 detroit diesel coupled with an Alliston transmission. Along with the two FTV 2500s we are established with many other tracked vehicles, mainly GO tracks. One which we call a Sadie is an 800 model modified for recovery use in snow or rough terrain. Along with the GO tracks, Alert has 2 × graders, 2 × Vohl snow blowers, 4 × D6 Cat Dozers, 6 × Tandem Dumps — 2 with plows, 2 × case FEL, 2 × RTFL, and 14 × crew cab 4 × 4s which are used on station summer and winter.

As you can well imagine, the Arctic temperature and rough terrain plays havic with our heavily used SPV fleet. Repairs consist of 1st and 2nd line and with some equipment 3rd line work must be done here in Alert. Ingenuity is a strong asset for a tech in this environment as parts or proper tools are not always available. During winter months only one aircraft a week is scheduled for resupply therefore you may have two or three large pieces of equipment on the floor waiting up to a month for backlog parts.
This causes difficulties as the shop is quite small and the number of vehicles needing repairs continually increases.

The busiest period is in the Spring (May-June). By this time, the snow has melted low enough that you can pull the equipment and vehicles out of winter storage (snow banks), and ready them for the many annual summer projects. Some of the larger operations are 1CEU construction projects, Ops Hurricane, BOXTOP I, II and III, TOPDOWN and Ops Kimno.
CFS Alert becomes a bee hive of activity in the summer and everyone requires some type of vehicle or equipment. Therefore, it is imperative that every vehicle is inspected and in Class 5 condition prior to this peak period.

CFS Alert has numerous activities, clubs and social functions all aimed at increasing the morale of the troops. A high degree of fitness is maintained by the section with early morning PT classes twice a week, coupled with a sports afternoon on Fridays. The many activities include computer, archery, photo, HAM radio clubs, and radio and TV stations which are operated by volunteers. The gym contains a curling rink and two bowling alleys, and mountain bikes are availabe for summer use. Plus year round, there are movies in the theatre and Morale Dinners and a Library.
For the individual who wishes to get out and keep busy, there is plenty to do. In alert, the quarters are called Houses and each House has its own rules, name and initiation. The 411 Tech MSE Ops and Supply Techs all live in Monster House. At this time we'll take the opportunity to say a big HELLO to all previous Monsters from Sgt Dan Corbeil, MCpl Mike Fortin, MCpl Mike Nobrega, Cpl Rick Sevigny, Cpl Tony Legge, Cpl Wayne Shay and Cpl Kel Lessor. "Remember Alert is only an Attitude".

In closing, Alert is a tour that people talk very little about. When they do it's usually about the size of the rabbits, the wolves, or how captivating the sun set and sun rise can be. Very seldom do you hear any talk about the strong emotional bonds you develop or the extremely difficult working conditions one endures when the station is pounded by heavy storms coupled with −60° temperatures day after day. All things being equal, it is probably better that little is said. An Alert tour must be experienced totally to understand the powers of the Arctic and how it affects all who spend any length of time in this humbling environment.

ARTE ET MARTE

FROM 202 WD

Last visit of BGen J.I. Hanson at 202 Workshop Depot

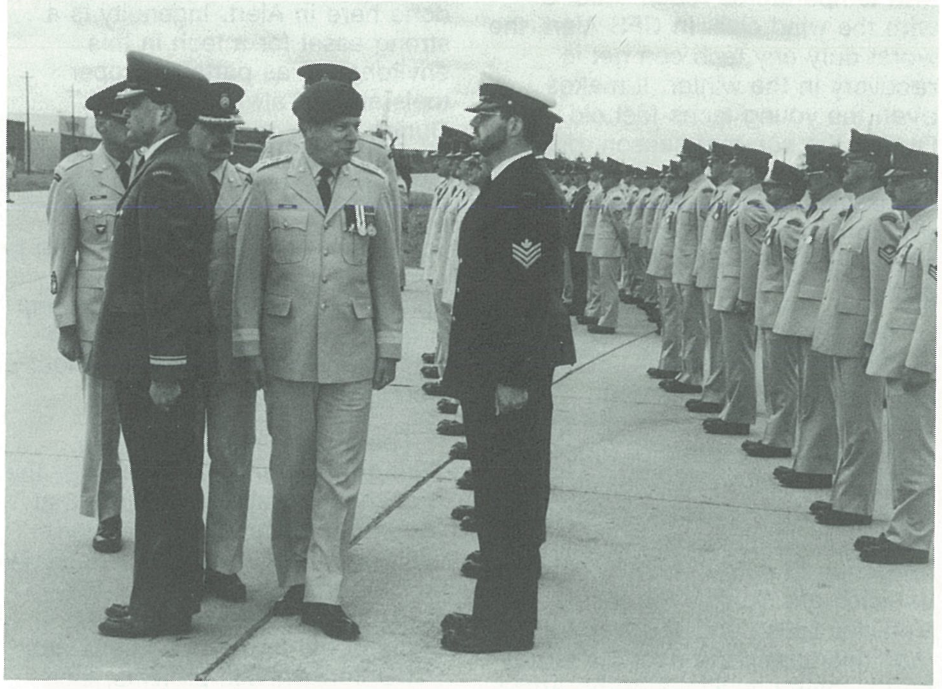
On 5 June 1990 under the cold blue sky of spring, Brigadier-General Hanson paid his last visit to 202 Workshop Depot as Director General Land Engineering and Maintenance.

As to underline the importance of this visit Colonel Marleau, Commanding Officer of 202 Workshop Depot, ordered that a ceremony take place on the test track.

The day started with a hearty breakfast in the presence of Colonel Marleau, the Workshop Operation Officer LieutenantColonel Coulombe, the President of the Officers' Mess Major Laflamme as well as the Aide-de-camp Lieutenant Lefrançois.

Brigadier-General Hanson arrived at 0930 hours for the Review of the Troops. All military personnel participated in this ceremony which consisted of an inspection of the troops and a medal presentation of an United Nations Medal to Corporal Soucy who recently returned from Namibia. There was a review of six vehicles including an M109 repaired by our workshops which demonstrated the large versatility of our unit. All vehicles were driven by our civilian employees for this occasion. To complete this ceremony two checks, one for $1200 and the other for $250 were presented to DGLEM for the 50th anniversary of RCEME.

To thank Brigadier-General Hanson for his implication in several important projects for 202 Workshop Depot such as the Leopard tanks, Colonel Marleau presented Brigadier-General Hanson with a sculpture of our unit's actual crest and of the new branch crest of which he is the sponsor.



Upon termination of the ceremony, Brigadier-General Hanson was invited to the Warrant Officers' and Sergeants' Mess to have a coffee with the senior non-commissioned members of the unit. The Regimental Sergeant-Major, Chief Warrant Officer Dionne, took advantage of the occasion to present him with a clock on behalf of 202 Workshop Depot.

After lunch at the Officers' Mess with all unit officers, Brigadier-General Hanson along with the Commanding Officer went to St-Hubert to visit the Base Maintenance Section.

At the end of this memorable day, all the division officers along with the Commanding Officer accompanied the General to a restaurant in old Montreal for a hearty supper.

Cost Accounting

A Management Tool at 202 Workshop Depot

In the spring of 1986, Colonel Pergat, then Commanding Officer of the Unit, was sold on the idea that it was insufficient to only meet deadlines and quality in production but it was also important to determine the cost of doing business. His personal goal for 202 Workshop Depot was to become competitive vis-a-vis civilian industry.

A few years later, after much sweat the idea is no longer novel, but the translation of this idea into practice is about to be achieved. An accounting system has been instituted. Although we know we must improve on its accuracy, the ground work has been done. Several systems have been put in place to gather, acccumulate, assess and assign all cost data to various accounts for reporting to our managers.

Our strategic plan is to refine these systems rendering our cost accounting system a better tool for performance measurement. Although it is necessary to control the expenditures in a central way, what is most needed and essential is user participation as they generate these expenditures. Do you know that the cost of refurbishing a Leopard tank represents the equivalent of overhauling three armoured personnel carriers? Yes, the cost of each activity at each work centre has been calculated. The engineering and project overhead costs have been assessed and the costs of parts have been added to each applicable work centre. We can as well evaluate and cost each product at any stage within the production process. We can analyse all various costs such as direct, indirect, parts, etc of any product within the Workshop. We can later compare the total product cost with either the cost in civilian industry or the cost evaluated by the LOMMIS System. For example, the cost to overhaul an engine (6V53) at 202 Workshop Depot compares favourably with the amount charged by a contractor in Western Canada. To be competitive in such a way vis-à-vis civilian industry is certainly an achievement in itself. We have to remember that 202 Workshop Depot is a military organization involved in all kinds of maintenance and military activities; its role is obviously unique and very different compared to a civilian contractor.

Our general thrust is to exercise management initiatives in obtaining the most effective and efficient use of resources in the production of all products and services at 202 Workshop Depot. We are seeking the involvement of our managers at all levels with our system by not only requiring them to give us the basic data but also in providing them the necessary feedback or management information to allow them to make timely and more economical decisions.

The information obtained from a cost accounting system can be limited to products; but from our experience, our managers are using this information in a much broader manner and the system will become a tool upon which all managers will rely for informed decision making. Thus seminars are underway to explain the benefits of cost accounting. In parallel we are examining both the FIS MARK III and the LOMMIS system to assure the adequate interface is available. And finally we are constantly developing cost figures on the remainder of our approximate 1100 products and services.

We definitely hope that our experience can be shared by all units and we welcome your ideas.

FROM LETE

Battlefield Damage Repair

By: John H. Gill

During active military combat operations, Battlefield Damage Repair (BDR) can make the difference between winning and losing. Specialized techniques for speeding up the return of unserviceable equipment to battleworthy condition will improve the chances of completing assigned operational missions.

ABSTRACT

A well structured and organized Battlefield Damage Repair (BDR) System can significantly increase the availability of major weapon systems, the number of completed missions, and possibly the final outcome of the battle.

The recent Arab Israel wars are indicative of successful BDR methods.

Although the Israel Defense Force (IDF) was outnumbered in many of the skirmishes, their repair units (using BDR techniques) revived most of the damaged tanks. The IDF repair units increased the availability of combat essential equipment; a deciding factor in the conflict.

This article describes BDR by briefly discussing concepts, repair, training and combat resilience; a few of the many factors comprising BDR.

INTRODUCTION

"... *you have given me my Division three times over...*"

Israeli Commander to his Ordnance Battalion, Yom Kippur War.

NATO Land Maintenance Systems are responsible for the operational fitness and availability of Land Equipment. Peace-time maintenance places emphasis on economic prevention and repair; leaning towards "repair by replacement." In the CF Land Maintenance System (LMS), the maintenance concept is to effect routine maintenance and engineering tasks primarily with in-house resources. These tasks are normally performed by technicians and/or technician/operator usually by exchange of parts or replacement of assemblies. The object is to maximize equipment availability and minimize downtime.

War, however, changes the normal maintenance situation to include equipment damage occurring on the battlefield — BDR with its "repair by repair" becomes the focal point of battlefield maintenance.

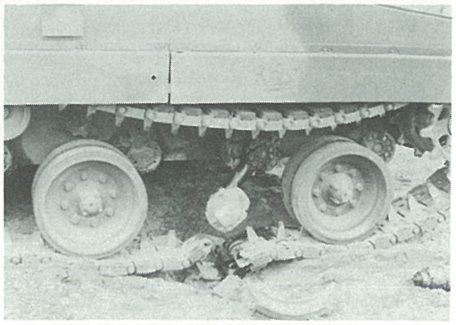
The live firing trials conducted by the German and British Armies at Meppen FRG have demonstrated that NATO weapon systems are not designed for fast battlefield repair. To sustain NATO Combat Forces on the modern battlefield, current NATO maintenance systems must alter their organizations and methodology to handle the anticipated workload.

Designers of future weapon systems will have to produce systems with greater combat resilience, so that damaged equipment can be more quickly repaired and returned to battleworthy condition in time to influence its operation.

CONCEPTS

The Canadian definition of BDR is "Essential repairs carried out rapidly in a battle environment, using improvised methods in order to return damaged or disabled equipment to temporary or permanent service."

EME tenets include: repair as far forward as possible to the maximum extent feasible and repair where the equipment breaks down if possible. The Canadian organizational structure of the Forward Repair Group (FRG) with its Mobile Repair Teams (MRTs) and Main Repair Group (MRG) blends itself well to BDR concepts.


Tracks destroyed by a mine.

Battlefield Damage Repair means the repair of all equipment damage occurring on the battlefield, including:

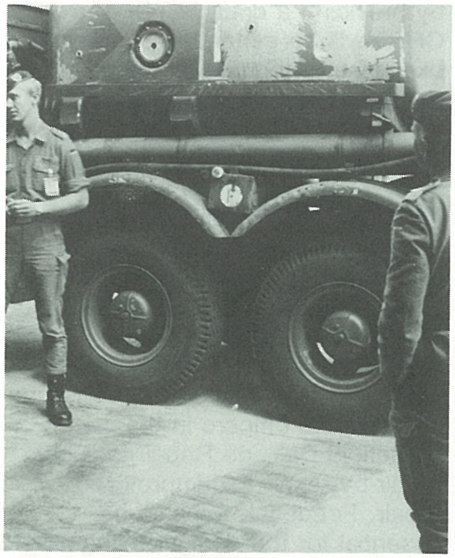
a. damage caused by enemy action,

b. normal failures; and

c. accidents.

BDR uses the unconventional or improvised repair methods that a technician or an operator resorts to when **TIME** becomes the overriding factor. Unconventional/improvised methods mean that when time is too short and/or spare parts are not available, the equipment will be repaired without delay using quick-fix procedures, like short-tracking, cutting damaged gun barrels and making use of fast patching materials such as epoxies, cold metals etc. Cannibalization and robbing are also within the scope of BDR. It must be strongly stated that quick-fix procedures should only be undertaken on the battlefield when normal repair methods cannot meet the operational requirements due to the shortage of repair parts, time, men or equipment.

BDR, with its quick-fix techniques, restores combat equipment to partial usefulness so that it can continue its mission or be recoverable (either being an acceptable objective). These improvised techniques, however, can cause deferred repairs and further degradation to the equipment. Consequently, some types of BDR may have to be redone using standard techniques at the earliest opportunity in order that



Fuel truck damaged by gun fire.

combat-essential equipment is operationally ready for the next assigned mission.

The operational Commander, governed by the tactical situation and acting on the advice of his Maintenance Representative, must decide what is most important to his mission and therefore sets the priority of repair for his combat-essential equipment. It can be seen from this that maintenance personnel must be thoroughly familiar with the battle plan and its tactics, in order to achieve the most effective repair and thus provide maximum equipment availability. The achievement of BDR can be allocated to three stages; Assessment, Decision and Repair.

BDR ASSESSMENT

The key to BDR is Assessment, which must be accurate since decisions with far reaching consequences must be made on the basis of the amount of damage equipment has (or is suspected to have) sustained. Inaccurate or incomplete assessments can commit men and resources to the repair of equipment that could not be repaired, or even partially readied, in time to satisfy the combat requirement.

To determine the extent of equipment damage, the assessor must:

a. trace the path of each round or piece of shrapnel from its point of entry to its exit (or to where in the equipment it became spent);
b. check for secondary damage around components that have been hit (as they too can create shrapnel);
c. verify ricochets and trace their paths;
d. check for splash-back (as a round exists, small splinters of metal can be thrown back and become embedded in cables, etc);
e. not make assumptions. Each round or piece of shrapnel must be thoroughly traced to avoid an inaccurate or incomplete assessment that can result in lost time and effort;
f. decide whether the repair can be deferred or must be done immediately;
g. prescribe the repairs to be performed;
h. determine the availability of components, materials and tools;
j. assess the manpower and skills required;
k. estimate the total time to repair,
l. prioritize repairs;
m. determine where to effect repair; and
n. decide if recovery is needed and to what location.

BDR DECISION

The repair decision will be made by the senior technician in situ. He must know the:

a. combat mission;
b. tactical situation;
c. maintenance capabilities, including available skills, tools, repair parts and materials;
d. maintenance workload;
e. location of maintenance units and equipment collection points;
f. recovery capabilities; and
g. local conditions including confusion on and around the battlefield, rapid moves, lack of communication, disrupted supply lines, and weather.

BDR REPAIR

Options include:

a. expedient repair at 1st line to suit combat requirements, allowing completion of the mission or executing of the next;
b. limited 1st line repair and self-recovery to reach 2nd line; and
c. recovery to 2nd line for repair; and cannibalization, robbing or destruction of damaged equipment which is not repairable or recoverable in the given situation (first obtaining higher authority if necessary or possible).

RECOVERY ON THE BATTLEFIELD

Recovery capabilities must be geared to combat losses plus the number and type of weapond being supported, and the following principles should be applied:

a. battlefield recovery is conducted when repairs are not possible in situ and further damage must be avoided;
b. similar tanks/vehicles for self recovery are to be used first; and
c. by priority, tanks/vehicles with the least damage should be recovery first, heavily damaged last, and those beyond repair to be left for cannibalization.

CANNIBALIZATION AND ROBBING ON THE BATTLEFIELD

Cannibalization is a means of performing repairs to non-serviceable equipment which can be expeditiously returned to combat by stripping parts, components or assemblies from similar tanks or vehicles that have been severely damaged and are beyond repair. Robbing is a form of cannibalization, with the intent of eventually replacing the stripped items and returning the main equipment to serviceable condition. Maintenance personnel resort to cannibalization and robbing when normal supply stocks are expended, supply lines are disrupted, or there is an urgent need for combat equipment to continue the operational mission. Cannibalization and robbing should be carefully controlled through the maintenance system.

BDR TRAINING

NATO countries in the last decade have, as a result of the various conflicts occurring throughout the world, placed emphasis on BDR in the development of maintenance philosophy, concepts, training, and live firing trials.

BDR techniques can only be effectively performed under wartime battlefield scenarios. To achieve competence in BDR techniques, maintenance personnel should be properly trained in advance, and BDR policies and techniques should be constantly tested under real or simulated conditions.

The UK, REME rely on six basic facets of training to enlarge the scope of BDR effectiveness:

a. basic skill;
b. continuing training;
c. versatility;
d. special skills;
e. equipment/system familiarity; and
f. practice.

At present, BDR techniques are not being taught to EME personnel. However, the following is extracted from Battlefield Damage Repair (BDR) Policy second draft; "BDR will not be regarded as a special knowledge held by a limited number of specialists. On the contrary, BDR will be taught to all technicians and all officers will be familiarized with it. War and peace establishments will not require amendment." The implementation of BDR training will pose many problems which have to be addressed at a later date by the EME Branch.

EQUIPMENT DESIGN

CF Land equipment is quite often acquire "off-shore" or "off-the-shelf", thus the Canadian Military does not always have a great deal to say in the actual design of its equipment. The CF does, however, try to purchase the material that best meets its requirements. NATO countries have recently become aware of the value of design for combat resilience (CR) and combat ease of maintenance (CEOM).

"Ease of Maintenance" and "Combat Ease of Maintenance" must not be confused or thought to be one and the same. CEOM is dependent on TIME and LOCATION involving repairs that are required on the battlefield with short time frames for repair. Current and future weapon systems must not only perform better than in the past, but also endure the conflict and survive battle damage.

Survivability, as spelled out in US Army Material System Analysis Activity (AMSAA), requires the following:

a. be difficult to detect and acquire;
b. if acquired, be difficult to hit;
c. if hit, be difficult to damage; and
d. if damaged, be easy to repair.

Difficult-to-damage relies on the design of the equipment to reduce battle damage. CEOM centres on expedient repair with available resources to restore the damage equipment of full or partial combat capabilities and/or self recovery in the case of vehicles. CR will have to be designed into equipment along with other requirements for performance, reliability and maintainability; consequently trade-offs are likely to take place in future designs.

It can be seen that CF Project Managers in the acceptance of new acquisitions will have to consider CR factors including the identification of critical component damage, assessability and repairability.

LETE, in the fulfillment of its role within the Capital Acquisition Program, can play a vital role through assessment trials for mobility, reliability, maintainability and combat resilience. Conducted trials can close the feedbacck loop and provide PM's with recommendations for improvements which will facilitate effective BDR. These trials can be further enhanced by conducting and/or operations.

SUMMARY

This article is not attempting to cover all the many facets of BDR — a complex subject. BDR can have a definite impact on the outcome of battles. The Warsaw Pact, with its numerical superiority in weaponry, forces NATO countries to consider the effectiveness of their systems in conflict and the capability of repairing equipment in order to complete each battle or perform at least one more mission.

LETE has been tasked by DLES 2 to become the centre of expertise for battlefield damage repairs, firstly by providing a draft CFTO. The BDR CFTO will be general in scope with examples of techniques as practiced by other NATO countries namely, West Germany, the United Kingdom and the United States.

CONCLUSION

This article has addressed BDR with the intent of showing that it is an operational "must". The CF Land Maintenance System, to be compatible with the other NATO Armies, must commence training its soldiers and officers in the art of Battlefield Damage Repair including repair-by-repair and improvised repair. Feedback will also be essential for the design changes and modifications which can improve the combat resilience of future acquisitions.

ADDENDUM

An article recently appeared in the International Defence Review (8/89) Battlefield Recovery and Repair — The Soviet Approach, by Mark Evans. It describes the Soviet attitudes to rapid recovery, repair of damaged equipment, and standardization of vehicle control layouts (reduces training and familiarization time of crews and technicians) which are coupled to the high speed continuous offensive. The NATO countries, in competing with the Warsaw Pact and its numerical superiority of weapon systems, will be hard pressed unless a well structured and efficient battlefield damage repair system is organized; one that is capable of coping with fast, mobile and intense armoured battles.

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